GrummanWorld

Volume 8, Number 1 | Our Employees Are Our Major Shareholders | January 13, 1989

O'Brien Encouraged By 1988 — 'But We Can Do Better'

Grumman World: *How did we do with the goals we set for 1988?*

John O'Brien: We improved a lot, but we didn't measure up to what we said we were going to do. I'm disappointed, naturally, but I'm encouraged by the improvements that I see. I believe we can do better. In my heart and soul, I know this company and I know the people in it. I know what we're capable of. We set a goal to get all of our production and assembly work back on schedule, and we met that goal. I have to give our production people a lot of credit. But we spent a lot more hours and dollars than we said we would: we didn't make budget. We have enormous pressures to reduce our costs; we're going through our third layoff now in three years, and of course that's very painful. But when you look back over the year, you can see that we're moving in the right direction; there's a lot to be proud of. You can see the changes happening.

GW: *Do you think Grumman Quality (GQ) is making a difference?*

JOB: Absolutely. Some people are really tearing into it, and enjoying what they see they can do. Others are saying, "let's just give it lip service and maybe it will go away," which is not a helpful attitude. GQ is not going to go away. I am going to make changes in this company until we come out at the top of the heap where I know we belong. We've got better people in this company than our competitors have in theirs. Through GQ, people are finding out they really can fix their problems. And it's the kind of thing that will accelerate, because people will jump on board when they see how well it works.

GW: *You have said that you think Grumman management is too laid-back. Any improvement there?*

JOB: There are encouraging signs, but I still see a lot of good people not doing what they're capable of doing. I see people here who don't make any demands or ask any questions — and you know that in their private lives they could probably drive a shoe salesman up a wall. We have a right to demand fair treatment from our customers, from our suppliers, from one another. And it's not that we're not working hard enough...

GW: *No?*

JOB: No. Now, I'm often accused of being a workaholic, but I try to plan time off. We've got people working here 12 hours a day, seven days a week and I discourage that wherever I see it. It's bad for your health, bad for your family. We don't have to work harder, just a lot smarter.

GW: *At one of the pin meetings, you said that you're concerned that so many young people are leaving Grumman. You've been here almost 35 years. If you were 25 years old now, how would you look at this company?*

JOB: Knowing what I know now, I probably would have been a priest as my mother wanted me to. I'm frustrated by the fact that a lot of younger Grummanites are bailing out, but I truly understand it. If they're Long Islanders, they're having trouble buying a house. We're in a business that's fallen out of favor with the Congress and with the public.

'I am going to make changes in this company until we come out at the top of the heap where I know we belong.'

GW: *So what would make you stay?*

JOB: I like to fix things; I like to make them work. If I saw that management was really trying to change things, I'd want to be part of that process. I think I'd see that underneath the image

(Continued on page 3)

What's Inside

Our Values - P. 2

Financial Facts And Figures - Pp. 4-5

You And Your Benefits - Pp. 6-7

Our Objectives - P. 8

GQ: Change Is Upon Us - P. 9

From Bethpage To Basdahl - Pp. 10-11

Joint STARS Team Can Deliver - P. 12

Grumman's Delivering Big Packages - P. 13

What's Up In Aircraft Programs - P. 14

Miles Of Wire, Tons Of Metal - P. 15

Future Attractions In High Tech - P. 16

Grumman Customers Get Excellence - P. 17

Four Faces Of Community Pride - P. 18

Grummanites Always Striving To Be The Best - P. 19

One Mean Cat. *A Grumman F-14A is ready to be catapulted off the deck of the U.S.S. Theodore Roosevelt. The new F-14A(PLUS) Tomcat with its more powerful engines is slated to enter fleet operations this year.*

Thanks To All Who Helped

We couldn't have produced this issue without the help of the Grumman Photographic Services department and our "correspondents" at off-Long Island sites.

A special thanks to photographers: Rich Breunig, Stephanie Burnette, Linda Byrd, Gerry Costello, Jim Ferris, Rich Harnage, Hank Hubbs, Dick Milligan, Bill Murtagh, Harry Prodromides, Ray Sander, Harold Sanders, Bob Sagliocca, Bob Settles, Linda Sparks, John Roselius, Karl Thoma, Becky Ursery, Larry van Wallendael, Jim Wagner and Larry York.

We'd like to thank all the other people who helped us all year: in Transportation, Repro Services, the mailrooms, and Facilities, to name a few. We also want to thank the people who fill out those readership surveys, and everyone who calls us or writes to us with story ideas, criticism, compliments and comments.

Happy New Year to everyone.

Twilight At Sea. *An A-6 Intruder prepares to land aboard a Navy aircraft carrier. Despite the recent cancellation of the A-6G program, the A-6 remains a mainstay of the fleet.*

People On The Cover

Grummanites pictured on the cover are:

Front cover: (L to R, clockwise) Paul Eng, an assistant aerodynamics engineer in Aircraft Systems, Bethpage; Paula Dawydiak, an associate computer architecture engineer in Aircraft Systems, Bethpage; Scot Kingsbury of Lab Operations in Aircraft Systems, Bethpage; Marvin Moore of Corporate Services' Plant Protection, Bethpage; Keith Troutman, an assembler at Grumman Allied's Olson truck facility in Mayfield, Pennsylvania; Fred Trinkle, a principal engineer for Integrated Logistics Support, Aircraft Systems in Melville; and Gabriel Scalzo, a riveter for the Olson division of Grumman Allied in Mayfield, Pennsylvania.

Back cover: (L to R, clockwise) Tina Outten of the Wire Department in Electronics Systems' Salisbury, Md., facility; Ed Booker and Bill Wiebke (R) of Repro Services, Corporate Services, Bethpage; Peter Hogan, Judy Wu, Terrence Brown, Jack Hoffman and Carl Barkley of the William T. Schwendler Development Center, Aircraft Systems in Bethpage; Hector Caccia, an Integrated Logistics Support-Electronics Packaging Design engineer in Aircraft Systems, Melville; and Paul Lemire, a project manager for Business Operations, Corporate Services Division, Bethpage.

Grumman World — Vol. 8, No. 1, January 13, 1989. Published twice a month for active and retired employees of Grumman Corporation. 1111 Stewart Ave., Bethpage, N.Y. 11714. W.B. Jones, Vice President-Public Affairs.

Norine Lyons
Director - Corporate Publications
575-3720

Kathleen Housley
Editor — 575-3293

Associate Editors
Bob Sample — *575-5118*
Susan Vassallo — *575-8999*
John Vosilla — *575-5119*

Bernadette Gately
Editorial Assistant — 575-4334

Mail Stop — A22-GHQ

Let Us Know

We don't want to do all the talking. We'd like to know what you think about the things you see on these pages. Your comments, suggestions and complaints are welcome. Please take a few minutes and give us your opinions.

Send your letter to:

Grumman World
A22-GHQ
Grumman Corporation
Bethpage, N.Y. 11714

Jody Garrell *is a Grumman EA-6B electronics countermeasures flight crew member at Calverton Operations on Long Island.*

Our Values

Grumman people have developed a set of shared values that create a sense of who we are and what differentiates us from other companies.

Our business purpose is to understand thoroughly our customers' needs and expectations, provide quality products and services that meet those needs and expectations in a cost effective manner and provide our shareholders an attractive return on their investment.

We believe in providing leadership that stimulates teamwork and mutual respect, encourages creativity and rewards individual performance.

Our corporate personality is shaped by the development and application of advanced technologies.

We attach great importance to dealing with people honestly and fairly. This governs our relationships with our customers, with our suppliers, with our community neighbors and with one another in the company.

In all our activities we are driven by the understanding that this is our company and that each of us has a personal stake in its future. We realize that our success as well as our corporate character depend on the total quality of the work done by each one of us.

Taffy LeBarron *builds LLVs at Grumman Allied's LLV facility in Montgomery, Pennsylvania.*

'This Year Will Bring Its Share Of Frustrations'

(Continued from page 1)
problem is a company with tremendous talent and potential.

GW: *How do you think Grumman will fare under the new administration?*

JOB: I think our product mix is more what the new administration will want to emphasize, but there's no doubt in my mind that defense budgets will have to be held down or cut. But as a nation we need to look not just at the dollars we're spending, but at the world we're living in and at what we'll have to do to defend ourselves. We don't seem to be doing that. Instead, we're concentrating on whether we should buy seven of these or three of those. We're taking a very narrow view.

We are living in a period of relative world peace, and we should adjust for that. That means that some of the R&D programs for things that would deal with world

'Any congressman can get headlines by picking on a defense program.'

war conditions should be slowed down. I think some bases could be closed, I think some troops could be withdrawn from overseas. I think we could get our NATO allies to pick up a bigger share of the cost of defending themselves.

The Russians see their economy faltering; they know they can't keep throwing all their money into defense. They want to put some back into their economy, and that means they have to get their world relationships settled down. The Chinese would like to become more technologically advanced, and so they're willing to compromise a bit to get there.

The toughest war we face is the economic war between European communities, the Japanese, the rapidly growing economies in the Far East, and our own economy. So it's not just the defense budget we have to think about, but the entire makeup of how we compete and do business here and overseas.

GW: *What will happen to the defense budget?*

JOB: It's easy to pick on defense. Any congressman can get headlines by picking on a defense program. There's an attitude that says all defense programs are bad, all social programs are good. Well, in fact, they both have to be appropriate, and they both have to be properly managed. It bothers me that there are no penalties imposed on a Congress that throws good money after bad on pork barrel programs.

GW: *Given those situations, how do Grumman programs look?*

JOB: Joint STARS looks good, because it's basically a defensive weapon. So is BSTS. They don't threaten anybody. They are the sorts of things we need as we move into a new phase of our relationship with Russia.

GW: *What about the Tomcat-21?*

JOB: The Navy people we've talked to are very enthusiastic: it's just what they're looking for. It's a logical development of a system already deployed. They made a tremendous investment 20 years ago in an airplane design capable of continuous modification and expansion. This proves to them they can get a return on that investment.

'We've made good choices in the technologies we emphasize.'

The Tomcat-21 will have 90 percent of the advertised capability of the ATF for 60 percent of the cost. It's a wise economic decision for the world we're in today.

GW: *Will that be recognized?*

JOB: I think so, unless the Congress ideologically decides that we must have one airplane, Air Force derived, for both services. Which would really be too bad. On paper, in theory, it works — in real life, it doesn't. We've tried it five times in this nation.

GW: *How do our other programs look?*

JOB: The E-2C is relatively secure, and I think the Navy will go through with a multiyear buy.

GW: *Don't you think it raises the anxiety of the people building it to think the end of the line is five years away?*

JOB: Yes and no. In the first place, it's more like seven years — and I think our people recognize that it would mean much more stability and assurance than we have now. The Japanese are committed to five more Hawkeyes, and other countries are also interested. If the Navy goes for a multiyear buy, and if you add foreign sales, the foreign country and the Navy get pretty good discounts. We get more production, and longer life for the program.

GW: *What about our other aircraft?*

JOB: The EA-6B is in and out of the budget. The Navy knows they need the system, it's high on their requirements list. We can't explain why it's not in the budget, but we think it will come back in.

Naturally, we're disappointed that the A-6G development program was cancelled. We're doing everything that we can to make sure that the A-6 and the EA-6 survive in some form.

We finish our multiyear production of C-2s with the last seven in 1989.

GW: *Are you pleased with the LLV program?*

JOB: They're doing a great job. It's right on schedule, and the Postal Service is very satisfied with a high quality product.

GW: *Do you see any end to our debt problem?*

JOB: Well, 1989 is our peak year. Fortunately, progress payments have been increased by a Defense Department that recognized it was jeopardizing the whole industry. Right now, 60 percent of our debt was caused by changes in the tax laws and in payment laws that govern how we do business. All were passed by Congress without any research or homework. We're not the only defense contractor in the same position; we're all in varying degrees of debt, depending on where our programs were when it all started.

That's why we have to concentrate on making profits here: it's the only way we can service our debt and reduce it.

GW: *What's Grumman's strategy to survive and grow?*

JOB: It is now, and has been, to broaden ourselves in defense markets. We haven't brought home all the winners yet. To get back into

'To get back into military space, we have to win BSTS.'

military space, we have to win BSTS. It will mean a long-term investment by the Air Force, and therefore they should buy the most capable system: not a compromise. I think we have the best system. We have to work our butts off to win BSTS; it's very important to our future. We're putting more emphasis on performance to make sure we win it, because it's worth $10 to $15 billion.

And we have to make sure that the Air Force knows by our performance that Joint STARS is going to work. Joint STARS is a $20-30 billion program with potential for foreign sales. It's the toughest software program in development anywhere right now, and our customer understands that and is working hard with us.

If we win those two, and get the Navy to buy the Tomcat-21, we'll be in good shape. Plus, we've got important projects in airborne

'Joint STARS is a $20-30 billion program with potential for foreign sales.'

early warning technologies. We have some interesting and challenging foreign programs. IFTE (Intermediate Forward Test Equipment) will go into production this year. We've got DMMIS (Depot Maintenance Management Information System), and that's looking good. We have balanced ourselves pretty well. In addition to the Navy, we have the Air Force, the Army, NASA, and many other customers. We've made good choices in the technologies we emphasize.

GW: *How is 1989 shaping up?*

JOB: For the last couple of years, I've made pretty much the same prediction. I wish I could say it won't be another pressure cooker year, but it will be. This year will probably bring its share of contradictions, accusations, and frustration. I can't change much of that. But there'll be good things, too — and we'll get through all of it by sticking together and making Grumman the best kind of place it can be.

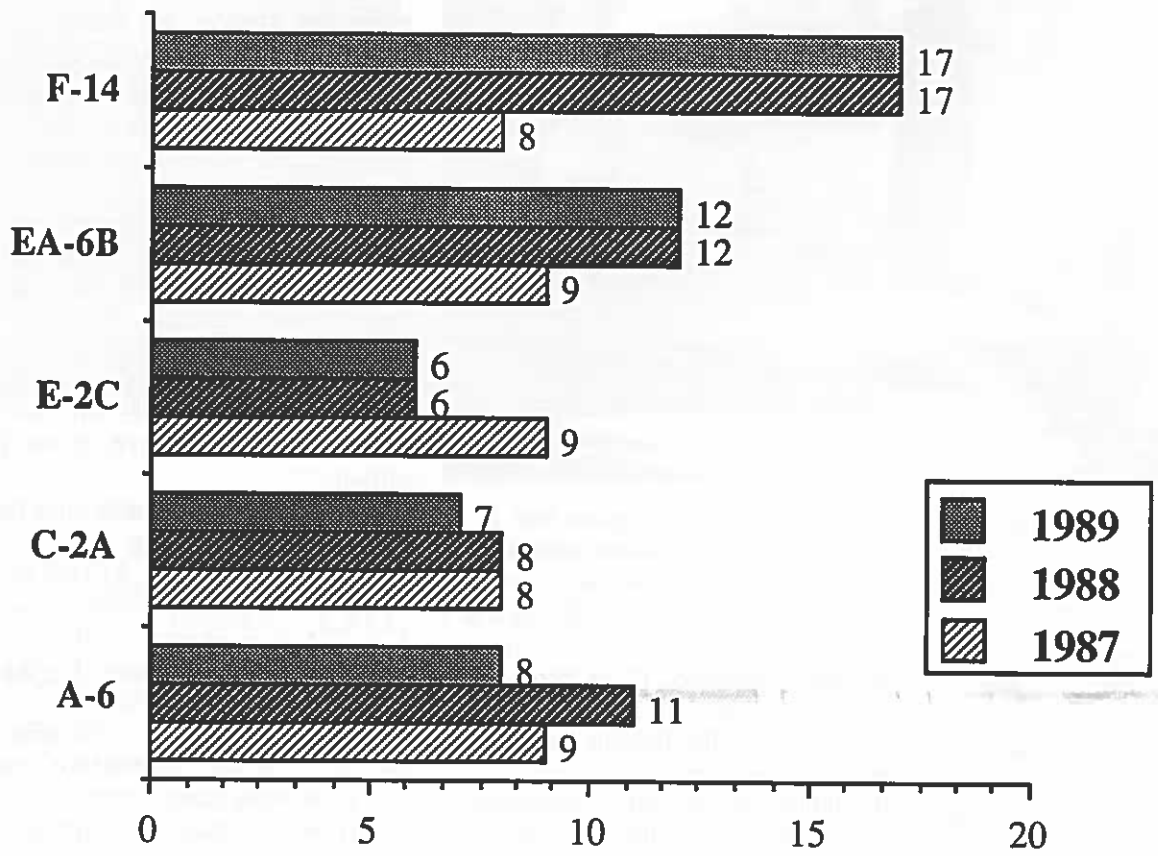
How Much Money We Earned Last Year

Results for the first nine months of each year

	1988	1987
Net Sales	$2,613,206,000	$2,427,972,000
Net Income*	$62,332,000	$43,013,000
Backlog	$7.9 billion	$7.9 billion

**From continuing operations*

Rolling Off The Production Line



A-6 Intruder — Modification figures aren't included in the program figures. In 1987, five were retrofitted with Target Recognition Attack Multisensors. Five TRAM retrofits were delivered by the end of November, 1988 and 18 are planned for 1989.

E-2C Hawkeye — Included in the chart are the three Hawkeyes delivered to Egypt in 1987. All of the six Hawkeyes built last year have the more powerful Allison engines.

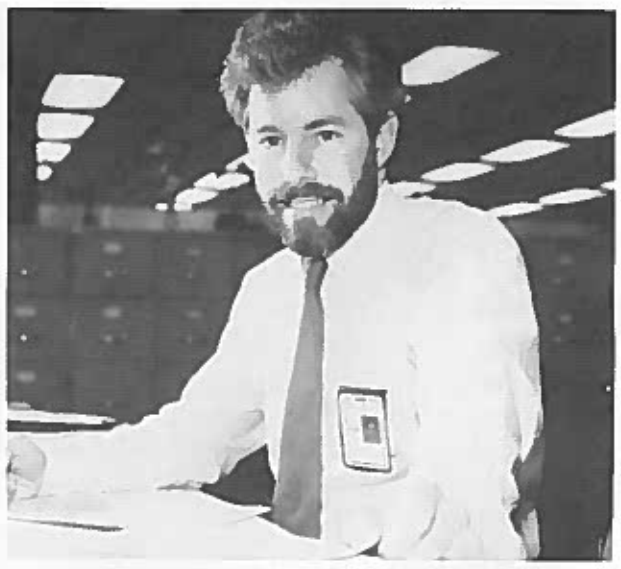
EA-6B Prowler — Twelve ICAP-1 Prowlers were converted to the ICAP-2 configuration last year. Twelve were converted in 1987. At least seven, and perhaps as many as 11, will be converted in 1989.

F-14 Tomcat — Seven Block 60/65 Update Program planes were delivered last year, completing the original contract. Eight F-14s were retrofitted to F-14A(PLUS) configuration last year. At least 10 will be retrofitted this year, and the figure could be as high as 19.

C-2A Greyhound — Grumman is producing 39 Greyhounds for the U.S. Navy under a five-year, multiyear contract. This year, this contract will be fulfilled when the last seven C-2A's are delivered.

OV-1 Mohawk — Stuart Operations put 22 Mohawks through its cyclic maintenance program last year. Sixteen Mohawks are scheduled for this year, and perhaps one more. The prototype Multistage Improvement Program Mohawk was completed last year.

A-10 — Grumman will deliver two Low Altitude Safety and Target Enhancement prototype kits and 38 production kits to the Air Force this year.



Buying So We Can Sell. *Paul Higgins is a senior buyer for Procurement Operations in the Corporate Services Division. He works in Building 30 in Bethpage.*

They Take Care Of The Shopping

In 1988, Grumman purchased about $1.7 billion of goods and services.

To do that, approximately 276,000 requisitions had to be processed. A requisition form includes information such as what needs to be purchased, quantity, price, required delivery date, and any other pertinent information.

Once the requisition is signed, a purchase order is written. Last year, about 173,000 purchase orders and amendments were issued.

The purchase order is the actual contract with Grumman and its vendors. An amendment makes a change on the initial order.

Grumman worked with about 9,000 suppliers last year.

Around The Planet

Last year, Grumman formed two new business relationships with China — a joint venture with Chengdu Aircraft Corporation to upgrade the F-7 fighter, and the Shanghai-Grumman International Fire Equipment Company, Ltd., which will upgrade China's fire engine manufacturing. Grumman also teamed with Gruppo Agusta SpA of Italy to develop a new U.S. Air Force trainer aircraft.

This year, Grumman's Pacific Rim (East Asia) marketing efforts will concentrate on the E-2C and future airborne early warning systems. The company also plans to market IFTE, C^3I systems, and the Penguin missile there. In Europe, it will stress Joint STARS and IFTE, and will be at the Paris Air Show.

A Second Life

On Long Island, Grumman recycled 4,025 tons of material in 1988. That's enough to fill over 400 standard rear-load garbage trucks.

Here's a breakdown of what materials were recycled: compost, 100 tons; scrap metal, 2,400 tons; computer paper, 800 tons; white ledger paper, 100 tons; low grade paper, 85 tons; cardboard and wood, 500 tons; and other, 40 tons.

In 1988, Grumman launched its office paper recycling program in five buildings: 30, 35, Headquarters, 2 and 5. By the end of this year, all Long Island facilities will be included in the program. Major off-sites are also expected to join in the effort this year.

Crunching Out The Numbers

★ In 1988, the people in Business Operations-Corporate Estimating prepared almost 9,000 estimates valued at over $10 billion. Estimates now include far more detailed data on Grumman's costs than in the past.

★ The Contracts department negotiated close to 4,000 contract proposals, to the tune of $3 billion in business last year. The work ranges from aircraft and subcontracts to spare parts. There are also about 1,000 active contracts; this department makes sure Grumman is in compliance.

★ Business Planning and Controls, together with government teams, successfully completed reviews of seven Grumman programs in 1988. The programs are: the Boost Surveillance Tracking System, the F-8 Peace Pearl, the S-2T Tracker, the F-14D, the E-2C, the Joint Tactical Information Display System (JTIDS) and the EF-111 Avionics Modernization Program.

★ Such reviews measure Grumman's performance against schedules and budgets. The result: a Tri-Service (Army, Navy, and Air Force) Validation enabling the company to compete for future work. Grumman has kept its "stars" since 1975.

★ Business Operations is also the stopping place for a very important piece of paper: the interdivisional work authorization (IWA). In 1988, over $700 million of work at Grumman involved divisions supporting divisions. That's about 20 percent of corporate sales.

How To Decode Your LLV's ID

Want to know how to identify when a Grumman Long Life Vehicle was built?

Each LLV that rolls off the assembly line has a seven digit identification number. Use the number 8214512, for example. The eight says it was built in 1988. The two denotes a half-ton vehicle. The 14,512 tells you how many have been built so far. The first truck made last year carries the number 8200001.

These numbers are entered into a computer program daily at the LLV facility in Montgomery, Pennsylvania.

Paper Workout. *Consultant specialist Marvin Jaffe works for Business Operations, Corporate Services Division, in Corporate Headquarters.*

Anchors Aweigh. *Grummanites in Arkadelphia, Arkansas, ready Renegade jon boats for shipment: (front, L-R) Robert Mauldin, Kenny Cooper, and Ronnie Sullivan; (back) Paul Hale.*

Sprucing Up The Place. *Grummanites Tommy Papa (L) and Scott Wilson recently painted a few sections of Building 12 in Hicksville. They work for Facilities in the Corporate Services Division.*

Facilities — All Over The Place

Last year, Grummman paid approximately $35.4 million for electric power at facilities throughout the U.S. That's a big bill, but it's about the same amount as in 1987. The company spent another $6.5 million on fuel.

Some relief is in store. Ground was broken on March 31, 1988, for a 50-megawatt co-generation facility to supply most of the Bethpage complex's power needs. It's scheduled to be completed in July of this year.

In 1988, the corporation moved out of 313,000 square feet of leased floor space, for a savings of $1.85 million annually. Last year, a number of new facilities went into use:

★ The 66,000-square-foot EA-6B program development center in Calverton;

★ The newly renovated Building 115 in Bethpage for the F-8 Peace Pearl program;

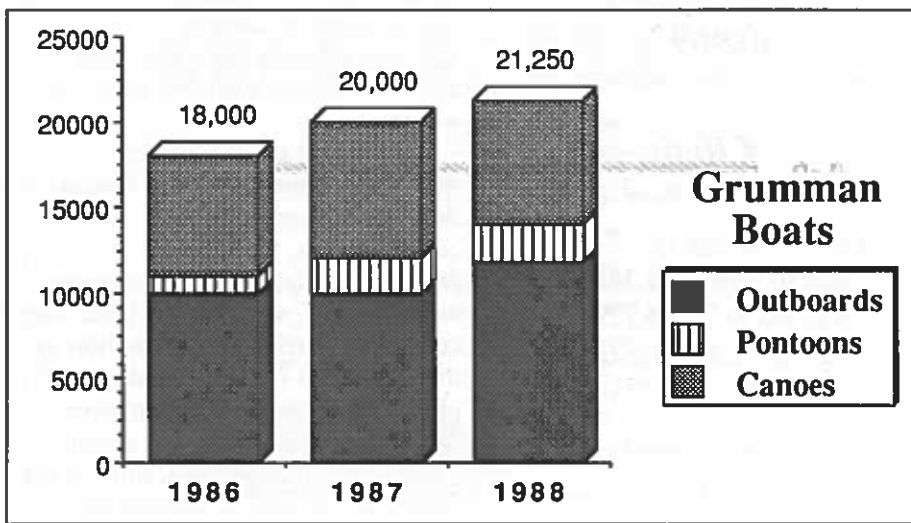
★ A new 172,000-square-foot building leased in Reston, Virginia, for the Space Station Program Support Division;

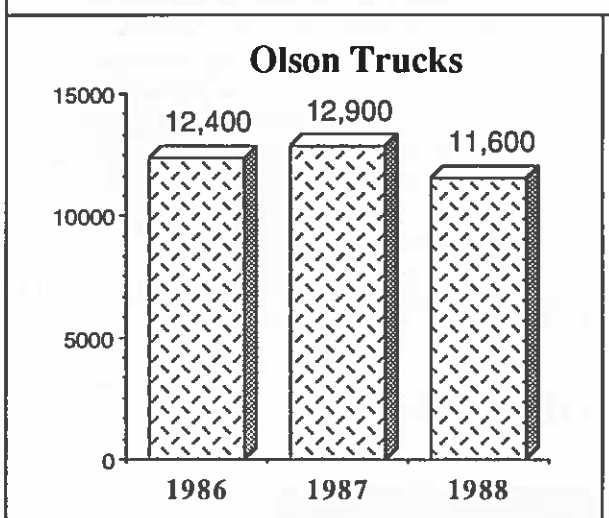
★ Grumman Allied's 130,000-square-foot centralized parts fabrication center in Lexington, South Carolina (Grumman also purchased 16 adjacent acres);

★ Building 387 in Fairborn, Ohio, a 60,000-square-foot leased facility that houses the Data Systems team working on the Depot Maintenance Management Information System;

★ Building 5's new Sensor Test and Integration Laboratory;

★ Additions to Grumman's Stuart (Fla.) Operations; the Corporate Research Center in Bethpage; and the field office in Whidbey Island, Washington.



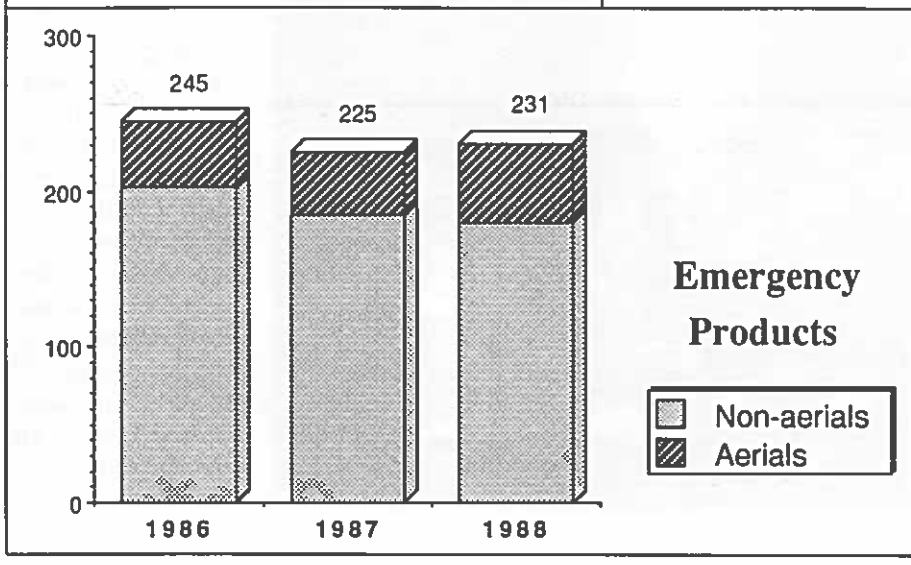


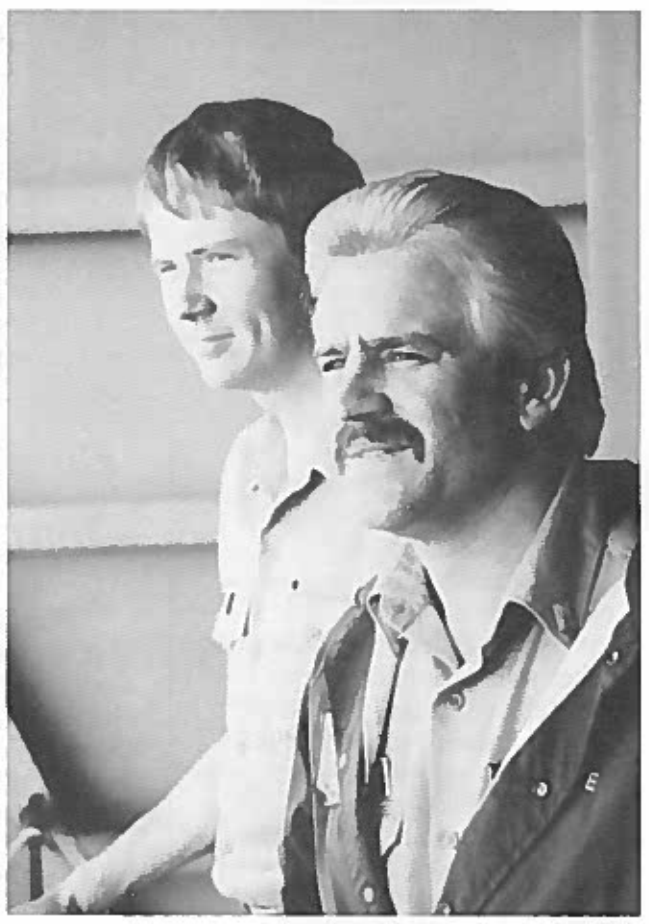
LLVs built to date: 25,276

Average per day: 95

Left to go: 73,874

*As of November 30, 1988





People — The Key To Success. *Working for the Aircraft Systems Division's Air Force Programs—A-10 in Melville, L.I., are (top, L to R) Mike Allocco, Robert Berkovits, Robert Butta, and Richard Galligan. At right, George Marshall (L) and Bruce Fenstermaker are Grumman field reps aboard the U.S.S. Theodore Roosevelt.*

Pension Plan

Members
24,623
As of August 19, 1988

New Retirees
651
As of September 28, 1988

Pensioners
(including spouses)
10,969
As of September 28, 1988

Age of Retirees
(includes spouses of deceased retirees)

Less than age 61—793
Age 61 to 65—2,142
Age 66 to 75—5,779
Age 76 to 85—1,523
Over age 85—173

Average Number Of Checks Received*
Male—192
Female—250

**Estimated; based on person retiring at age 62.*

Fringe Benefits Costs Top $407 Million

Grumman spent a record $407.9 million on fringe benefits in 1987 — up $78.6 million from 1986.

With the Grumman payroll at close to $1.2 billion, that averages out to $34 worth of benefits for every $100 you made in 1987. The 1988 figures were not available when we went to press.

In 1987, $88 million went for mandatory benefits such as Social Security, unemployment compensation, workers' compensation, etc. These expenses were only $67.4 million in 1986. The company contributed $53 million to the Grumman Pension Fund in 1987, plus $16 million for the Employee Investment Plan's company match. Other costs included $140 million for paid time off, and $8 million for other benefits.

The biggest jump in fringe benefits costs was in group insurance. It climbed to $100 million in 1987 — up $29.4 million from the previous year.

As of August 19, 1988, 24,623 Grummanites were members of the Grumman Pension Plan. This plan is called a "defined benefit" plan. The amount of any pension is determined by a specific formula. Grumman raises or lowers its contributions to the plan each year to keep the plan's assets at a level that matches any present and future obligations. At the end of December 1987, the plan's assets (used in the actuarial evaluation) were over $1.6 billion.

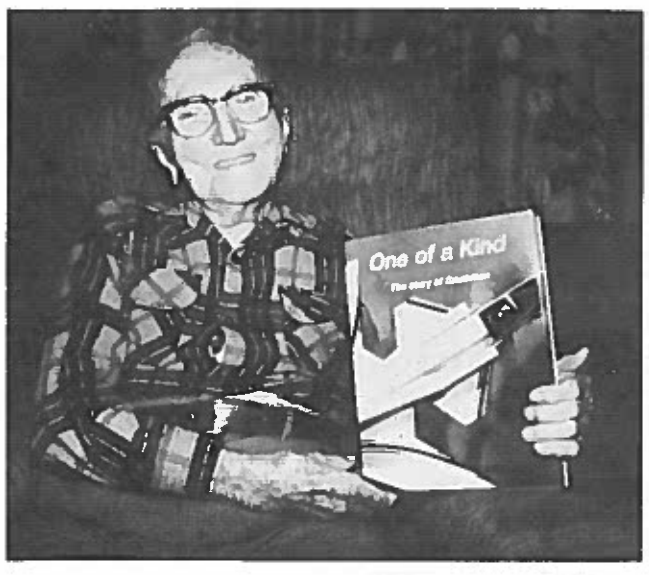
Close to 11,000 Grumman retirees (including spouses) collected a pension through this plan in 1988; 651 new retirees joined the pension payroll this year.

Grumman Allied has its own plan; there were 1,676 members as of December 31, 1987.

Grumman Technical Services, Electronics Systems' Salisbury Operations in Maryland, and Tachonics in New Jersey have capital accumulation plans with 3,079 members as of July 27, 1988.

Other groups have profit-sharing plans or other plans as appropriate, and the company contributes toward the accounts either in lump sum or in installments.

324 Pension Checks... And Still Counting



"Grumman has been wonderful to me," says George Haegele with a big grin on his face. "Look how long they've been paying me to do nothing."

Haegele is Grumman's oldest living retiree. At 96, he is full of life and hangs on to every memory of his 19½ years in the Upholstery Shop at Grumman. "They were the best years of my life," he says.

"We had such good times," adds Haegele, who lives in St. James, L.I., with his daughter. "All the guys would come in an hour-and-a-half early just to play ping-pong together."

At 21, Haegele came from Germany to the United States to attend college. A year later, World War I broke out and his father wired he could no longer send him money. Haegele eventually opened up his own upholstery shop and then in 1942 was hired by Grumman for 50 cents an hour.

Haegele is anxious to give advice to today's young people. "Whatever it is you enjoy doing, stick with it," he says. "Life is too short not to be happy. When I was a kid I used to joke about how I was going to live to be 100. Well, that's only four years away now."

Plenty Of Activity In Benefits World

As of September 1, 1988

★ 2,896 Patient Advocate calls

★ Number of prescriptions filled with mail order program:
Active employees
31,235
Retired employees
33,293

★ 25,424 people in Grumman/Travelers group health insurance program

★ 6,484 people belong to HMOs

★ Over 400,000 health claims processed

★ 13,720 people purchased vacation time

★ Number of people using flexible spending accounts:
Health: 3,197
Dependent care: 203
Legal plan: 3,415

Co-Op, Sweet Co-Op

Tom and Grace Ranalli found a lower-cost alternative to the single family home: they purchased a cooperative apartment.

Tom is an associate composites engineer for Materials Engineering in Bethpage's Building 12. Grace is an interior designer in New York City.

"We wanted to live in Nassau County, but we could never have afforded a house here," says Tom. After a short search, the Ranallis bought a one bedroom co-op in Oyster Bay, Long Island. A co-op buyer purchases shares in the corporation that owns the apartment building.

The Ranallis saved by purchasing their apartment "as-is," then doing the remodeling themselves. The bedroom is big enough for their newest piece of furniture: a bassinet. They expect their first child this month.

Tom used the Grumman Employee Investment Plan (EIP) to save for the down payment, through both pre- and after-tax contributions. "Even with the new tax rules, if you take into account the interest you earn and the ability to one day own a home, it's worth it," Tom says.

Homeowners. *The Grumman EIP enabled the Ranallis to save for the down payment on their co-op.*

EIP Update A Call Away

The Grumman Employee Investment Plan Office in Corporate Headquarters has a recorded message featuring information on unit values and any late breaking news that EIP members should know about.

Call (516) 575-4400 for the recorded message.

Hats Off To Medical

★ In 1988, over a dozen medical seminars were conducted including presentations on cancer and diabetes.

★ Grummanites had their pick of 24 dates to have their cholesterol level checked. Approximately 4,551 people were tested.

★ Over 278 Grummanites are now certified in cardiopulmonary resuscitation because of the 17 training sessions Medical offered.

★ More than 220 health test kits — such as the test for colon cancer — were ordered.

★ About 2,000 attended this year's health fairs in Bethpage and Calverton. Over 30 agencies were there to explain their services. Several fairs were held off Long Island as well.

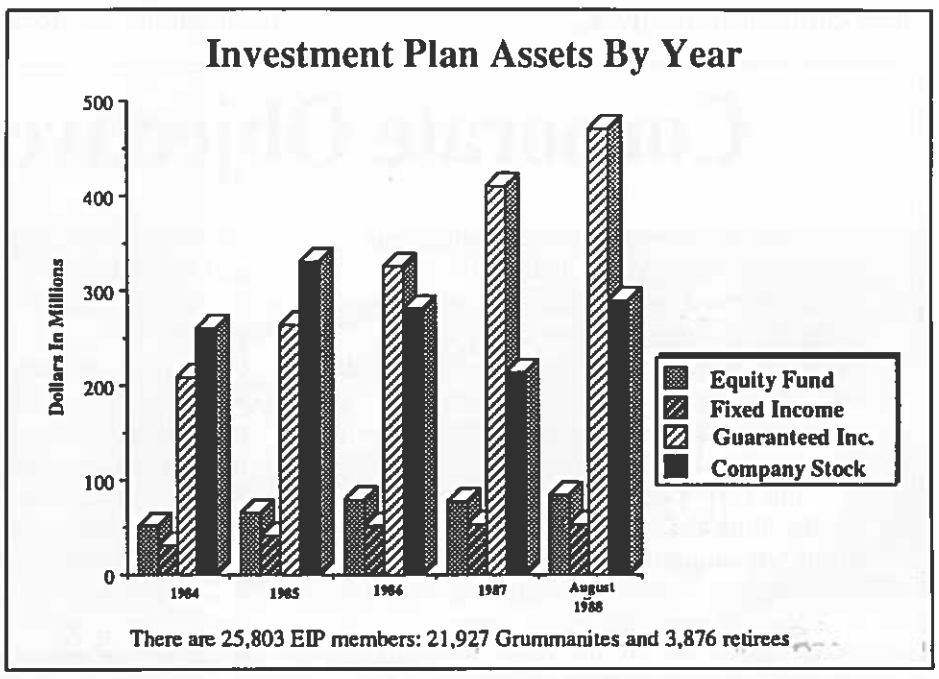
★ In 1988, 897 Grummanites underwent glucose testing.

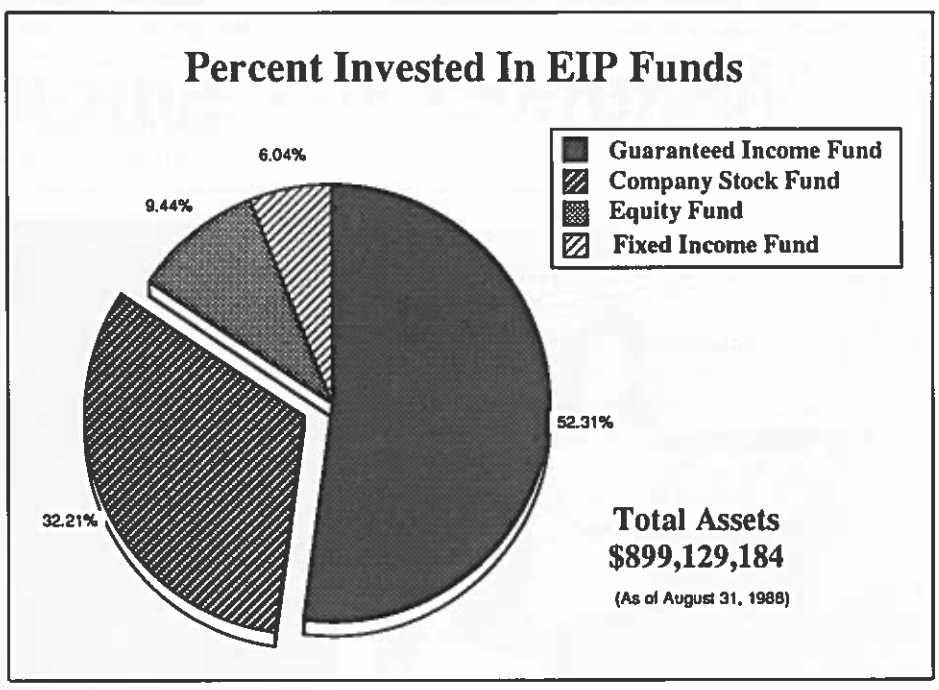
★ In May, 1,366 people had their blood pressure checked during Hypertension Month.

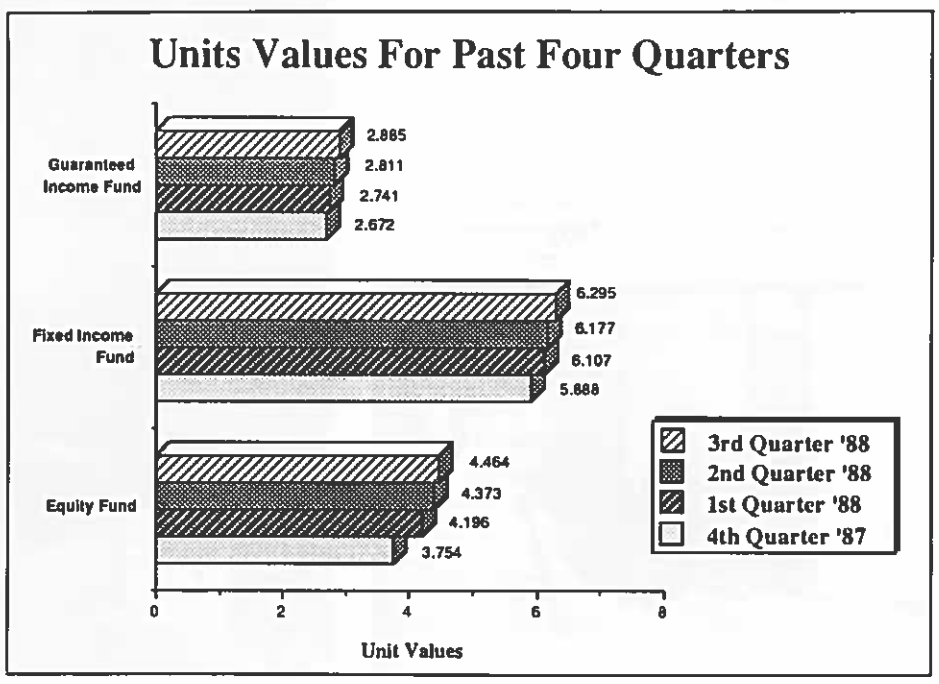
★ 250 women received a mammography test.

★ 600 smokers swapped an apple for a cigarette on National Smokeout Day, November 17.

On-site Testing. *Last fall, Ada Colter, coordinator of Grumman Health Services, helped these two Grummanites fill out forms for the cholesterol testing in Building 30, Bethpage.*







Our Objectives

On June 24, Grumman Chairman John O'Brien unveiled the company's objectives, which outline the overall business plans. O'Brien said that the senior management group did a lot of pushing and pulling and soul-searching to arrive at the statement of objectives. He pointed out that the statement of objectives gives the company's basic direction — but it's not a detailed road map. The statement of objectives follows:

We start from a position of four basic strengths: a talented, loyal work force; a diversity of programs and customers; an understanding of advanced technologies; and modern engineering and production capabilities.

From an overall business perspective, we will:

• Achieve progressive growth in annual sales and improved after-tax profits. Specific goals will be established for each division to meet corporate objectives.

• Enhance our relationships with our customers, the investment community, government policy makers, and our industry's leaders.

• Institute a Grumman Quality Process in 1988 to enhance our competitiveness. This concept will demand the direct participation and total commitment of the entire Grumman team, starting with the chief executive officer.

Grumman's market objectives for the near term are as follows:

• Maintain our position as a premier tactical aircraft developer and builder.

• Expand our space business through our nuclear, sensor system, radar and vehicle expertise.

• Expand our systems integration and professional services expertise without limitation to any particular platform.

• Expand our electronics systems business through further applications of existing products and initiatives such as robotic vehicles and missiles.

• Expand our data systems integration efforts with emphasis on custom systems applications to the Federal market and through the expansion of the third party computer maintenance business.

• Aggressively participate in subcontracts using available assets.

• Maintain our leadership position in the specialty commercial vehicle market.

• Expand international sales of our products and services.

In pursuit of these objectives, we will establish priorities for selected new business targets. Two vital events for the company in the early 1990's are a BSTS win and a successful Joint STARS development program leading to award of a production contract.

Corporate Objectives Constantly Evolving

"We are constantly re-evaluating our objectives," says Vice Chairman-Development Dan Huebner. He notes that some of the corporate objectives on this page are being modified to better reflect the ever-changing market and its impact on corporate strategy. These modifications will be announced in the spring.

Top corporate priority is being placed on the Tomcat-21 and the Joints STARS effort. In addition, Huebner points out that the company is now concentrating most of its space business efforts on space surveillance, namely the Boost Surveillance Tracking System (BSTS), and its Space Station related work.

A Grumman-led team and a Lockheed team both have development contracts for BSTS. In August 1990, the Air Force will select a contractor to design and build the satellites which will be flown in the '90s and beyond.

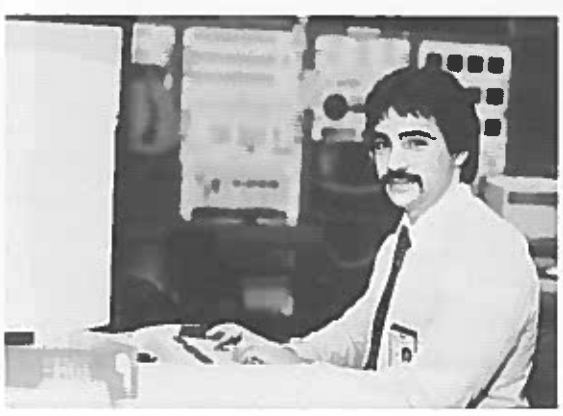
As for electronics systems business growth, he says, "The basic emphasis will be on our established position in the automatic test equipment market and on program products. For example, we have initiated an international thrust in Europe for our Intermediate Forward Test Equipment.

"We are also concentrating our efforts on military subcontracts. One such program is the V-22 empennage and tail section," he says. "We shipped the proposal in October. A production award winner will be announced in early 1989."

Huebner is cautious about the expansion of the specialty commercial vehicle market. "A commercial version of the Long Life Vehicle (LLV) continues to be tested. However, we're still not ready to decide whether to produce a commercial LLV," he adds.

In the international market, Grumman is pursuing the sale of its products. "In addition to sales of E-2C's and S-2T's, we have made inroads in offering the corporation's expertise," says Huebner. "Two prime examples: the Super-7 and the Peace Pearl Program, both for the People's Republic of China." In addition, Grumman recently signed a 30-year joint venture agreement with China to form a consortium of Chinese and European companies to build fire fighting equipment in China.

According to the Investor Responsibility Research Center, Grumman became number three among U.S. arms exporters in 1987. McDonnell Douglas and General Dynamics are first and second. New York State received over $700 million in arms exports contracts. Over $500 million is attributable to Grumman sales. Grumman's exports tripled over 1986.



Doing Their Part. *Three of the thousands of Grummanites who can help the company reach its objectives are: (top) Kim McCorkle who builds transcowls at Stuart Operations in Florida; (below) Charlie Giannetto, a flight control engineer in the Schwendler Development Center, Bethpage; and Ed Lee (R), thermodynamics systems engineer, Boost Surveillance Tracking System in Space Systems.*

The Big Picture. *Grumman Quality is company-wide. Shown are: (L) Daniel Winder and Ronald Niklaus of subassembly, Allied-LLV, Montgomery, Penn.; (above) Chuck Hess, leadworker—cable and bench assembly, Electronics Systems, Great River, L.I.; and (below) Sue Harris, an electrical technician in harnesses, Houston, Tex. (on loan to Calverton, L.I.).*

Grumman Quality: Reshaping The Company

GQ Means Grumman Quality

In 1988, the Grumman Quality process began changing the way Grummanites do their jobs, the way the company conducts business, and the intrinsic corporate culture.

At Grumman, divisions and departments have long participated in quality enrichment programs. But Grumman Quality is a landmark effort in that it will reach the entire company, top to bottom.

"Grumman Quality is helping this company and its people become better at what we do," says Dean Cassell, vice president, Product Integrity and Environmental Protection. "In today's hotly competitive business world, the way we've always done things may not be good enough."

Grumman Quality starts with a change in the way people view quality. It is not just a production-line concern. The Grumman Quality process aims to improve the way every task is performed at Grumman — even the typing of reports or recordkeeping.

Grumman Quality also puts a premium on customer satisfaction — and customers aren't only the buyers of Grumman's products and services. "Unfortunately, most of us forget that the people in the next department are our customers, too," says Cassell. "The quality of our product, our level of responsiveness, affects them and makes them either happy or angry.

"Ultimately, Grumman Quality will make it easier for people to do their jobs, improve our products and services, and enhance our competitiveness," says Cassell.

The company has attained its goal of getting most of its divisions involved in Grumman Quality. So far, about 675 Grummanites have taken the two-day Grumman Quality training seminar. The first to be trained were Grumman Chairman John O'Brien and corporate and divisional officers; middle managers and supervisors are now involved.

The seminar covers the definition of quality and teaches participants to see how problems in their areas affect division and corporate objectives. Participants also learn the Grumman Quality process — a way to thoroughly analyze all possible solutions to a problem.

Once trained, Grummanites get down to problem solving in quality action teams. There are 63 such teams now throughout the company. (See box on this page for a breakdown by division.)

"That's quite an achievement," says Cassell. "Grumman Quality is working on serious problems, and people have a natural resistance to change. There have been lots of heated discussions — and I'm sure we'll see much more of that. Still, the vast majority of the people involved in Grumman Quality have become enthusiastic participants."

The most noteworthy accomplishments so far are the four solutions put into place by action teams.

• Two Aircraft Systems teams joined up to solve their closely related problems. They streamlined the way work statements and cost estimates are produced for engineering change proposals. Among the changes: estimators will be involved from the beginning, there will be fewer approvers, and a current staff manager will be assigned to expedite the project.

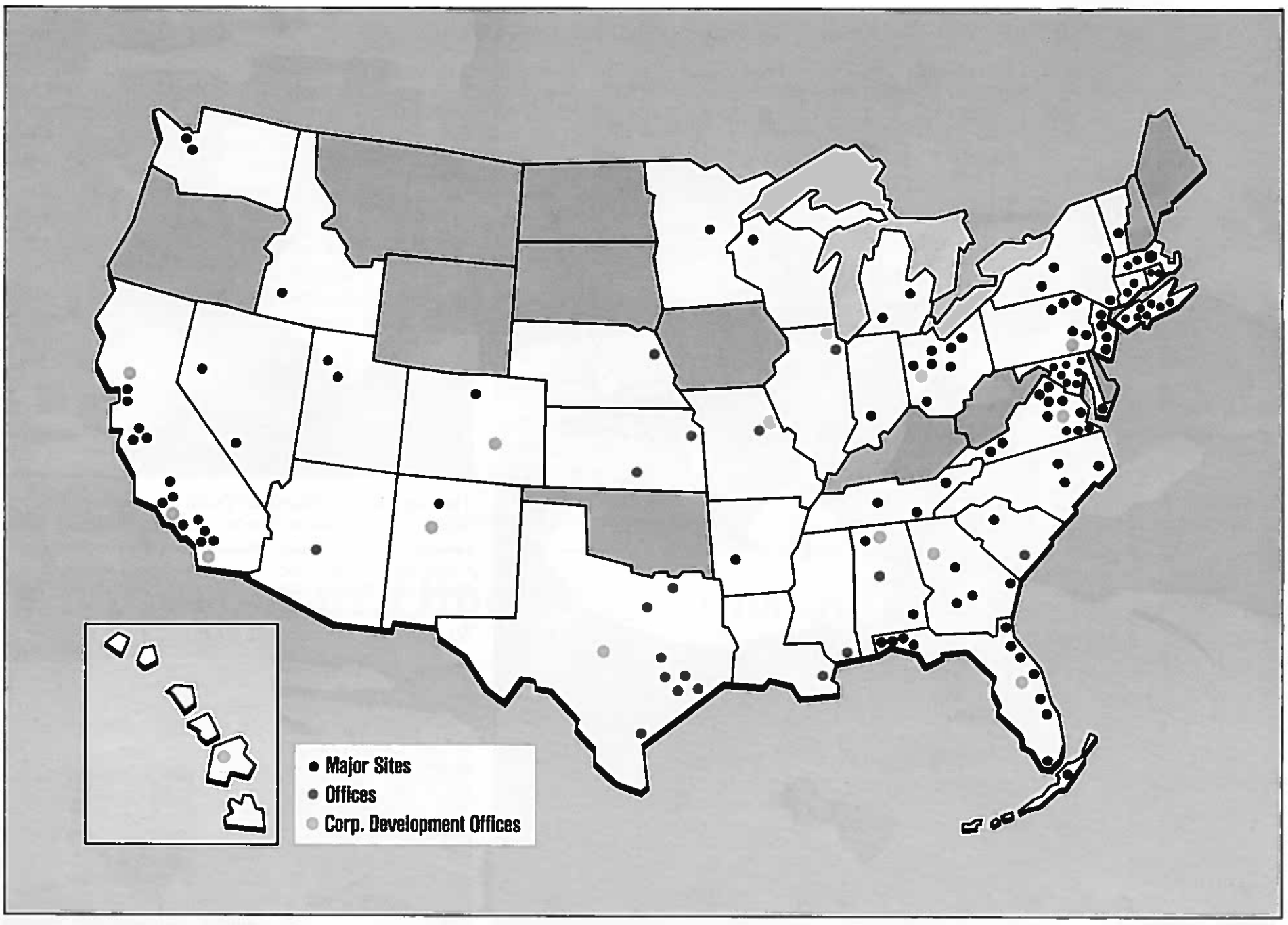
• A Data Systems team has written a new procedure that will speed up the hiring process. Personnel requisitions will need only two approval signatures before going to Corporate Personnel, within five days at the most.

• An Aircraft Systems team came up with a way to further improve inventory procedures and decrease parts shortages.

In addition, 37 Grummanites were trained as facilitators — the people who guide action teams. People in Space Station Program Support and several Grumman Corporation departments have not been involved thus far. They will be brought on board in early 1989. More solutions are expected shortly from teams in Aircraft Systems, Data Systems, and Business Operations.

The GQ Rollcall

Division	Teams	Facilitators
Aircraft Systems	19	13
Data Systems	11	10
Electronics Systems	6	4
Space Systems	4	3
Allied	4	-
Corporate Services:		
Business Operations	6	4
Corporate Procurement	2	3
Personnel & Administration	2	-
Grumman Corporation:		
Corporate Technology	2	-
Corporate Development	2	-
Grumman International	1	-
Melbourne Systems	2	-
Technical Services	2	-



Our World — From Bethpage To Basdahl

Alabama

- Space Station Support, Huntsville
- Data Systems, Huntsville
- Electronics Systems, Huntsville
- Grumman Systems Support Corp. (GSSC), Data Systems, Birmingham
- Corporate Development, Huntsville
- Technical Services, Dothan

Arkansas

- Grumman Boats (Allied), Arkadelphia

Arizona

- Technical Services, Luke AFB

California

- Corporate Regional Office: Western, Los Angeles
- Corporate Development, Los Angeles
- Aircraft Systems, NAS Alameda
- Aircraft Systems, Edwards Air Force Base
- Aircraft Systems, NAS North Island
- Aircraft Systems, MCAS El Toro
- Grumman Olson (Allied), Fresno
- Space Systems, Irvine
- Aircraft Systems, Pacific Missile Test Center, Pt. Mugu
- Aircraft Systems, Naval Weapons Center at China Lake
- Corporate Development, Sacramento
- Aircraft Systems, NAS Miramar
- Data Systems, San Diego
- Corporate Development, San Diego
- Grumman Olson (Allied), Tulare
- Space Systems, Los Angeles
- Technical Services, Alameda
- Technical Services, China Lake
- Technical Services, Edwards AFB
- Technical Services, El Toro
- Technical Services, Lemoore
- Technical Services, NAS Miramar
- Technical Services, NAS North Island
- Technical Services, Point Mugu
- Technical Services, Sacramento
- GSSC (Data Systems), Concord
- GSSC (Data Systems), Los Angeles
- GSSC (Data Systems), San Diego

Colorado

- Corporate Regional Office: Southwestern, Colorado Springs
- Data Systems, Colorado Springs

Connecticut

- GSSC (Data Systems), Meriden
- Technical Services, Orange

Florida

- Aircraft Systems, Ft. Walton Beach, Eglin AFB
- Space Station Support, NASA/KSC
- GSSC (Data Systems), Kennedy Space Center
- Melbourne Systems, Melbourne
- Aircraft Systems, NAS Key West
- GSSC (Data Systems), Melbourne
- Electronics Systems, Melbourne
- Corporate Development, Orlando
- Grumman St. Augustine, St. Augustine
- Aircraft Systems, Stuart Operations
- Technical Services, Titusville
- Technical Services, Duke Field
- Technical Services, Eglin AFB
- Technical Services, Homestead AFB
- Technical Services, Hurlburt Field
- Technical Services, Kennedy Space Center
- Technical Services, Key West
- Technical Services, NAS Pensacola
- Technical Services, NAF Mayport, Jacksonville

Georgia

- Corporate Regional Office: Southeastern, Atlanta
- Data Systems, Albany
- GSSC (Data Systems), Atlanta
- Aircraft Systems, Milledgeville Operations
- Aircraft Systems, Warner Robins AFB
- Technical Services, Warner Robins AFB
- Corporate Development, Warner Robins AFB
- Technical Services, Savannah

Hawaii

- Corporate Development, Honolulu
- Data Systems, Honolulu

Idaho

- Aircraft Systems, Mountain Home AFB
- Technical Services, Mountain Home AFB

Illinois

- Corporate Regional Office, Des Plaines
- GSSC (Data Systems), Schaumburg

Indiana

- Technical Services, Naval Weapons Support Center, Crane

Kansas

- Melbourne Systems at Boeing Military Airplane Company, Wichita
- GSSC (Data Systems), Kansas City

Louisiana

- Aircraft Systems, New Orleans
- Technical Services, New Orleans

Maryland

- Aircraft Systems at Litton Industries, College Park
- GSSC (Data Systems), Gaithersburg
- Aircraft Systems, Glen Arm
- GSSC (Data Systems), Linthicum
- Aircraft Systems, Naval Air Test Center, Patuxent River
- Electronics Systems, Salisbury
- Space Station Support, Greenbelt
- Technical Services, Naval Air Test Center, Patuxent River

Massachusetts

- Corporate Development, Lexington
- Grumman Olson (Allied), Lexington
- GSSC (Data Systems), Woburn
- Data Systems, Lexington
- Technical Services, Worcester

Michigan

- Grumman Olson (Allied), Sturgis
- GSSC (Data Systems), Troy

Minnesota

- Grumman Boats, Brainerd

Mississippi

- Technical Services, Keesler, AFB

Missouri

- GSSC (Data Systems), Maryland Heights
- Corporate Development, St. Louis

Nebraska

- GSSC (Data Systems), Omaha

Nevada

- Aircraft Systems, Nellis AFB
- Technical Services, Fallon AFB
- Technical Services, Nellis AFB

New Jersey

- GSSC (Data Systems), Fairfield
- GSSC (Data Systems), Cherry Hill
- Tachonics (Electronics Systems), Plainsboro
- Space Systems, Princeton

New Mexico

- Corporate Development, Albuquerque
- Space Systems, Los Alamos National Laboratory

New York

- Grumman Corp., Bethpage and Bohemia
- Aircraft Systems, Bethpage, Calverton, and Melville
- Data Systems, Bethpage, Holtsville, Calverton, Woodbury
- Grumman Boats, Marathon
- Aerostructures, Melville
- Allied, Bohemia
- Electronics Systems, Bethpage, Great River, Bohemia, Woodbury and Melville
- Space Systems, Bethpage
- Technical Services, Bethpage
- Technical Services, Fishkill
- Grumman Olson (Allied), Jericho
- InfoConversion (Data Systems), Woodbury
- Data Systems Institute, Woodbury and Bohemia
- GSSC (Data Systems), Syracuse
- GSSC (Data Systems), Albany
- GSSC (Data Systems), Woodbury
- GSSC (Data Systems), New York City

North Carolina

- Aircraft Systems, MCAS Cherry Point
- Technical Services, MCAS Cherry Point
- GSSC (Data Systems), Fayetteville
- GSSC (Data Systems), Raleigh

Ohio

- Space Station Support, Cleveland
- Data Systems, Fairborn
- GSSC (Data Systems), Bowling Green
- GSSC (Data Systems), Brookville
- GSSC (Data Systems), Cincinnati
- Corporate Development, Dayton
- GSSC (Data Systems), Strongsville
- Grumman Ohio Corp., Worthington

Pennsylvania

- Grumman Olson (Allied), Mayfield
- Electronics Systems, Benton Park
- GSSC (Data Systems), Monroeville
- LLV (Allied), Montgomery
- GSSC (Data Systems), Norristown
- Aircraft Systems, Aviation Supply Office, Philadelphia
- Technical Services, Aviation Supply Office, Philadelphia
- Corporate Development, Warminster

Rhode Island

- GSSC (Data Systems), East Providence
- Technical Services, Smithfield

South Carolina

- Data Systems, North Charleston
- Grumman Allied, Lexington

Tennessee

- Data Systems, USAF Arnold Engineering Development Center
- Space Systems, Oak Ridge National Laboratory
- GSSC (Data Systems), Chattanooga

Texas

- Corporate Development, Houston
- Space Systems, Houston
- Space Station Support, Houston
- Technical Services, Corpus Christi
- Technical Services, NAS Dallas
- Technical Services, Johnson Space Center, Houston
- GSSC (Data Systems), Houston
- Corporate Development, San Antonio
- Grumman Olson (Allied), Sherman
- Grumman Houston (Aircraft Systems), Webster
- GSSC (Data Systems), Dallas
- GSSC (Data Systems), Austin

Utah

- Technical Services, Hill AFB
- GSSC (Data Systems), Salt Lake City

Vermont

- GSSC (Data Systems), White River Junction

Virginia/Washington, D.C.

- Space Station Support, Reston
- Grumman Corporation, Arlington
- Data Systems, McLean
- Data Systems, Arlington
- InfoConversion (Data Systems), McLean
- Corporate Development, Hampton
- Aircraft Systems, NAS Norfolk
- Technical Services, NAS Norfolk
- GSSC (Data Systems), Richmond
- Emergency Products (Allied), Roanoke
- Emergency Products (Allied), Vinton
- Aircraft Systems, NAS Oceana
- Technical Services, NAS Oceana
- Technical Services, Langley AFB
- Technical Services, Dam Deck

Washington

- GSSC (Data Systems), Redmond
- Aircraft Systems, NAS Whidbey Island
- Technical Services, NAS Whidbey Island

Wisconsin

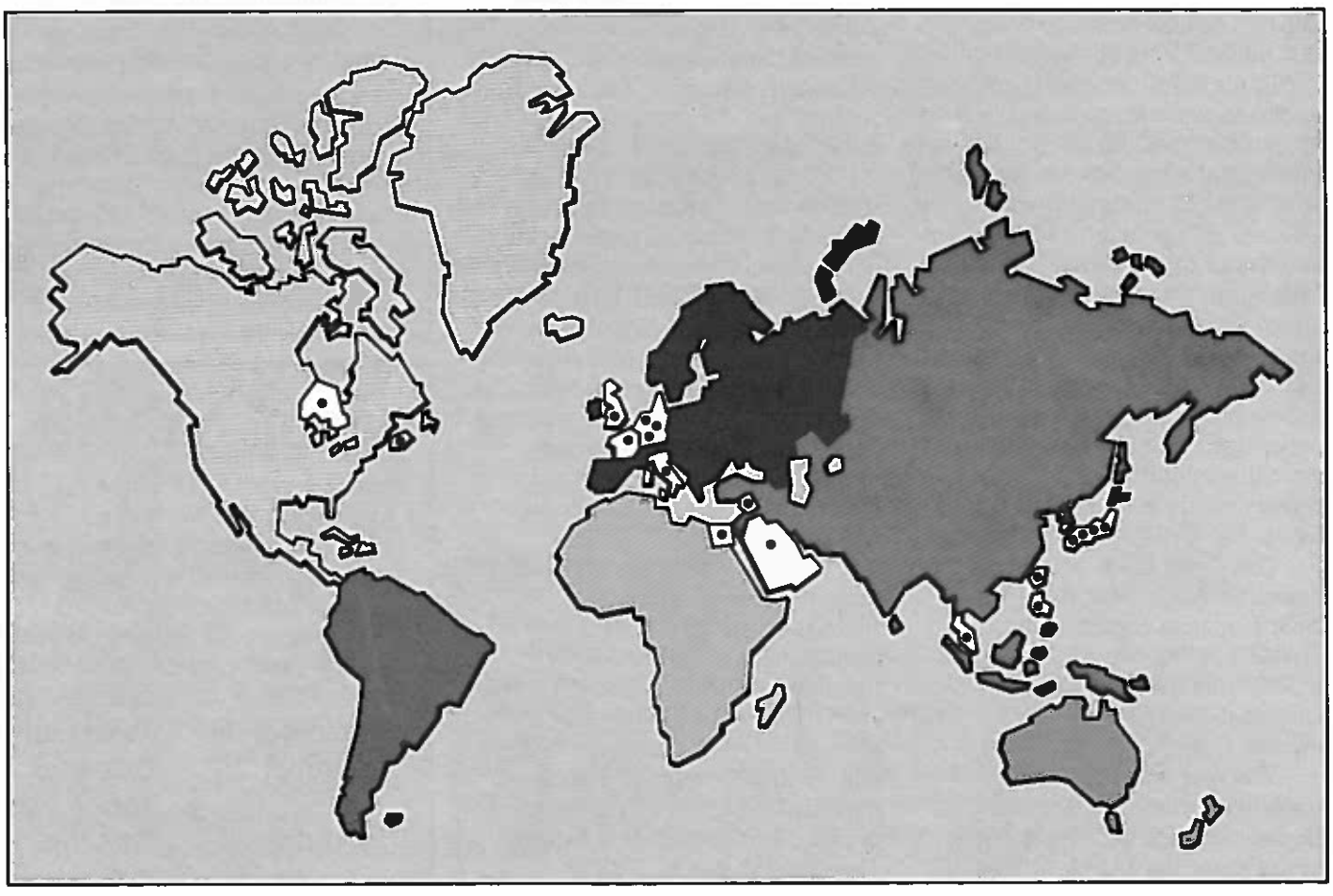
- Grumman Boats (Allied), Minong

International

- Corporate Regional Office: Canada, Enfield, Nova Scotia
- Grumman Olson (Allied), Canada, Oshawa, Ontario
- Grumman International (GII), Paris, France
- GII, Tel Aviv, Israel
- GII, Singapore
- GII, Taipei, Taiwan, Republic of China
- GII, Tokyo, Japan
- GII, Seoul, Korea

Also Grummanites in Technical Services and Aircraft Systems work at the following locations:

- Cairo, Egypt
- Upper Heyford, England
- Bad Munder, Germany
- Basdahl, Germany
- Pruem, Germany
- Sigonella, Italy
- Atsugi, Japan
- Iwakuni, Japan
- Yokosuka, Japan
- Seoul, Korea
- Suwon, Korea
- Cubi Point, Philippines
- Saudi Arabia (27 sites throughout)
- Singapore



Joint STARS Team Shows Its Customer It Can Deliver

Melbourne Systems successfully passes '88 critical milestones

MELBOURNE, Fla. — "It was kind of a do or die year for Joint STARS," says Program Vice President Marty Dandridge.

When Grummanites in the Melbourne Systems Division began 1988, they faced several critical milestones. On several occasions, they had to contend with reaching two milestones at the same time.

The first goal was the first flight of the E-8A on March 31. There were some difficulties in getting the old, modified 707 ready for takeoff, but the plane flew less than 24 hours later on April 1 at 1:15 p.m.

At the same time, scores of Grummanites were preparing for the Systems Preliminary Design Review which began April 18. Between 120 and 150 Air Force personnel were on hand for the review. "We worked through 1987 to get ready for this critical design review," says Dandridge. During the two-week period, Grummanites told the Air Force how they were developing the software for Joint STARS, and how they were documenting their work.

On the day the review began, the Defense Acquisition Board met in Washington, D.C., to determine the fate of the Joint STARS program. Several weeks later, the Defense Department and Air Force officials issued their decision: full speed ahead.

'This program is very large with several critical paths.'

"It was a very strong sign of the Defense Department's and the Air Force's commitment to Joint STARS," reports Dandridge. "In an environment where the Defense Department was cutting billions out of its budget, the Joint STARS budget was increased by $1.4 billion."

In the memorandum issued by Undersecretary Taft, several key issues were resolved. The government expanded the program from 10 to 22 aircraft. It accepted a schedule change due to the complexity of the system. A third test aircraft — a new 707 — was approved for funding. A block improvement program was initiated.

"It was a very positive indicator of how our customer views us," says Dandridge. "We're proving that we can deliver Joint STARS when the military needs it in the next decade."

There was more good news: in its overall request for fiscal year 1989, Congress increased its Joint STARS funding from $337 million to $347 million to add some additional funds for the third aircraft.

The year was not without headaches. It became obvious that the radar system was not going to be ready for the March 31 first flight. The delivery date was pushed back to September, so the flight test agenda was shuffled a bit.

"We were able to put the antenna on the aircraft to measure the vibration characteristics in the flight environment," says Dandridge. "We found some problems that we fixed, but had we waited until the fall as we originally planned, it would have cost us delays now."

Shortly before Thanksgiving, the third phase of flight tests was successfully completed. During this phase, the communications and navigation equipment were tested and they worked extremely well.

'Our customer is very demanding; the technology is very complex.'

The Monday following Thanksgiving, the second E-8 aircraft for the Joint STARS program arrived at Melbourne Systems. Like the first Joint STARS aircraft, this modified 707 will serve as a prototype airborne platform.

From November 28 to December 8, the final critical design review of the entire system was held. Once again, scores of Air Force people were at Melbourne Systems. U.S. Air Force Colonel Jack Colligan, deputy commander for Joint STARS, told the Grumman team that the government considered the review a huge success.

The next big milestone was to flight test the radar system by the end of the year. "We worked three shifts, doing a month's worth of work in a week," he adds. "We were confident about making the radar flight before Christmas."

On December 22, the radar flew for the first time. It was airborne for six-and-a-half hours. All flight objectives were met; it verified the complex steering commands that point the radar's antenna and the integrity of the radar transmission elements.

"This program is very large with several critical paths," says Dandridge. "Our customer is very demanding; the technology is very complex. We finished 1988 in the blitz mode. People can only do that for short periods of time. After the first flight and design review in the spring, people had to take vacations and long weekends. Everyone looked forward to the year-end holiday break for a well-deserved rest."

This year, the pace will still be intense as the program goes into flight testing. "It will be a challenging year. Function by function, we'll determine if everything is working as we planned," says Dandridge. "1989 will be another year of critical milestones, but we've got the team in place that can make it happen. They proved that in 1988."

Grumman Blue. *In the debriefing room after a recent flight test were Grummanites (above, L to R) Dennis Haggarty, instrumentation engineer; Byron Gibbs, test conductor; Steve Hydron, communication engineer; Rosemary Karika, software engineer; Frank Finkelstein, flight test engineer; Steve Valla, flight test engineer; and Charles Greer, instrumentation engineer.*

Kudos For Joint STARS Team

23 December 1988

Dear Members of the Joint STARS team,

Congratulations. This was an extraordinary year for the Joint STARS team, made possible by extraordinary people like yourselves. It was a year of high risk because we needed to restore confidence in the team's ability to perform on agressive schedules. Your leaders, sure of your talents, proposed a challenging path and you charged down that road hitting each milestone on time. To list the accomplishments of 1988 is impressive: first flight of Aircraft No. 1; Systems Preliminary Design Review accomplished; antenna control flights completed; development and demonstration of operations and control software; development and demonstration of communications software; completion of PME installation into Aircraft No. 1 to Phase IV configuration; delivery of Aircraft No. 2; Critical Systems Level Design reviewed; radar integration; first radar flight; and many other less obvious but still important achievements. In my nine years as an Air Force program director, I can't recall being able to list a more impressive set of one year's accomplishments by a contractor team.

Challenges for the Joint STARS team are not, however, behind us. An ambitious software design, coding, lab test and aircraft test program lies ahead as we move from the firm base we established this year to the requirements we must demonstrate. Our confidence that you can do the job is high, based on the marvelous accomplishments of 1988.

I wish each of you and your families best holiday wishes from the Joint STARS Program Office and hopes for a well-earned rest in the next week.

Sincerely,
John J. Colligan, Colonel, USAF
Program Director for Joint STARS

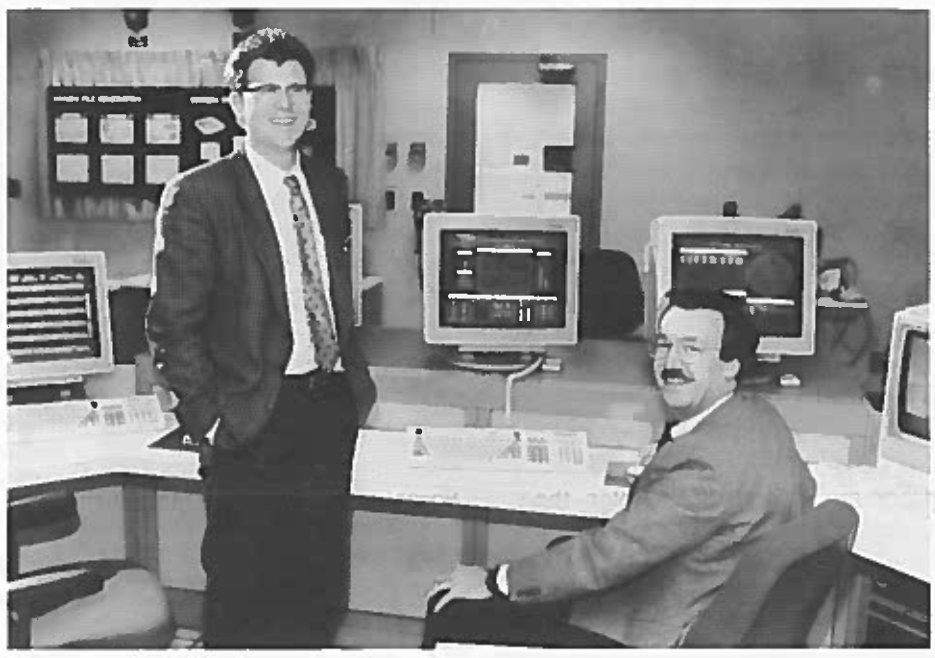
Joint STARS 1988 Milestones

April 1	First flight of E-8A aircraft
April 18	Two-week Systems Preliminary Design Review begins
April 18	Defense Acquisition Board meets to determine fate of Joint STARS
July 5	Defense Acquisition Board releases its findings: full-speed ahead
September 30	Radar delivered
November 28	Two-week Final Critical Design Review begins
December 22	First flight of Joint STARS radar

Space Is The Place. *In Reston, Virginia, Sam Ximenes (above) is helping put the pieces together on the Space Station Program Support effort, while Mike Selbach (below, L) and Curt Fogarty are helping launch the BSTS program in Bethpage.*

Neither Rain Nor Snow. *Grummanites such as Jeffrey Miville at the Long Life Vehicle plant in Montgomery, Pennsylvania, deliver about 95 Postal Vehicles a day to the U.S Postal Service.*

Grumman's Delivering Several Big Packages



BSTS

Grumman Space Systems is developing the Boost Surveillance and Tracking System (BSTS) for the U.S. Air Force's Space Division, Air Force Systems Command. The $304 million contract was awarded in March 1987.

BSTS will use satellites with infrared sensors to detect and track ballistic missiles just after launch. The information is then relayed to U.S. attack warning systems.

The 34-month contract is part one of the demonstration/validation phase. The final design of BSTS is slated for April 1990. In August the Air Force will select a contractor to build an experimental satellite which will be test flown in the next decade. The Grumman-led team is competing against a Lockheed team.

Recently, Grumman opened a new sensor test and integration lab in Bethpage. The facility will enable Grumman to test, integrate and validate actual space sensor hardware against a simulated earth infrared background including missile targets. The lab can also be used to test any type of space hardware.

Space Station Support

"It was a moving train," says Fred Haise, president of Grumman Space Station Program Support Division. "We joined a program that was already under way. We had to hire and train new people and keep up with that moving train.

"It's been the most difficult program startup I've ever worked on," he says. "But we've stayed right on schedule with both the technical assignments and our recruitment efforts."

The division now has 362 people, up from 188 in 1987. Counting its teammates, the total on the project is 564. The first significant program milestone was the program requirements review, which was finished in late June. NASA, Grumman, and team members are continuing to review findings from subsequent reviews by NASA centers of the contractors on the four Space Station work packages.

In the program requirements phase, the capabilities of the Space Station are spelled out in a set of specifications. The next phase moves into preliminary design, the approach to meeting those requirements. The preliminary design review will take place in the third quarter of 1990.

Another milestone the program reached in 1988: the division and team members moved to a single new address at 1760 Business Center Drive in Reston, Virginia.

IFTE

The Intermediate Forward Test Equipment (IFTE) program has one more hurdle to clear to make the U.S. Army team. That's the In Process Review, when the Army will make its decision to start the IFTE production line rolling.

Electronics Systems' Test Equipment Products group based IFTE on its System X technology. System X stores in computer memory all the instrument algorithms it needs to test a circuit; instruments are then configured when needed.

This design's big test took place under combat-like conditions last summer at Ft. Bliss, Texas. Eight weeks of rough terrain and heat didn't faze the two IFTE components that the Army will use in the field: the truck-borne base shop test facility and the portable contact test set.

Depending on the In-Process Review decision, Electronics Systems could start producing them in March and delivering them in 1990.

Electronics Systems delivered the first commercial IFTE equivalent units in 1988. Harris Corporation in Orlando, Florida, Tobyhanna and Anniston Army depots and Grumman are using them to develop test software for field applications.

Right now, IFTE is slated to troubleshoot all new and many current Army weapons. Presently, test software is in the works for the modernized Hawk missile and the Multiple Launch Rocket System, which will be fielded by both the Army and the Marines. NATO, too, is evaluating IFTE for the seven member nations that use these two weapon systems.

LLV

Grumman Allied's Long Life Vehicle Division finished up its first full year of operation. In April 1986, the United States Postal Service awarded the division a $1.1 billion contract to build 99,150 postal trucks.

Since the first truck rolled off the assembly line in April 1987, the production rate has increased to over 95 trucks a day. To date, more than 25,270 vehicles have been delivered.

"Last year, employees scrambled to keep up with the production lines," says Larry Parsons, vice president, LLV Operations. "As everyone uses the equipment more and more they are finding smarter and better ways of doing the work.

"Our biggest gains have been in the final inspection area," says Parsons. "When production first began, 100 percent of the vehicles required rework. We are significantly reducing that number every day as work teams continue to refine their areas throughout the plant."

The LLV contract is Grumman's biggest single contract ever. The Post Office has an option for an additional 56,000 vehicles.

Their Work Adds Up

The numbers are mind-boggling: 2.9 million detail and machine parts made of steel, aluminum, titanium and composites; 232,000 structural and electrical subassemblies.... It's all in a year's work for Production Operations.

Last year, Production Operations modernized many areas that make those parts. Milledgeville's getting a new computer that will be the heart of its Grumman Engineering and Manufacturing System. Calverton got a second DITMCO tester on the F-14 line and a computerized system that will reduce the time required to inspect major fixtures.

Since 1980, nearly $100 million was invested in the Parts Fabrication Center in Bethpage. This modernization will be complete next year.

The Pride's Everywhere. *You can see it in John Impagliazzo (top C) who inspects F-14s at Calverton; Frank Davis (top R) who works on F-14 wing boxes in Bethpage; and this E-2C team: (from L) Bill Gilbertson, Fred Lambui, Tom Carr, Alex Monaco, (standing on steps) Vin Bonomo and Al Cote, Pat Carley, Pat Lamb, Richard Longwell and Rich Orbach. To build a better F-14, Grumman uses no. 7 (at L), which is instrumented for structural flight work.*

What's Up In Grumman Aircraft Programs

F-14

The F-14A(PLUS) entered its first full year of production and the F-14D development program passed some important milestones in 1988.

In August, the Navy put Tomcat number 503, the F-14D full scale development aircraft, through 26 sorties over eight days. The service's test team evaluated the third of what will be six parts of the entire software package that will drive the new Tomcat's advanced avionics and weapon systems. With this software, the F-14D has approximately one-quarter of all the new software that Grumman must write.

The testers' verdict? Thumbs up. Based on the results, a Navy program decision meeting gave its approval for limited rate production of the F-14D in Fiscal Year 1990.

Recently, the fourth edition of the software was delivered to Calverton to start flight testing. In 1988, Grumman also flew the Tomcat's new dual chin-pod for the first time. The pod contains both infrared and video cameras.

Though the Navy may choose to put one more F-14 into the Block 60/65 Modification program, the last of the planes included in the original contract was delivered in December. Those planes are now being flown by two Naval Reserve squadrons in Texas. There are also 24 operational Navy Tomcat squadrons and two training squadrons.

E-2C/C-2A

A host of E-2C target detection and tracking improvements have either recently been added to the production Hawkeyes or will be within the next several years.

Among them are improved surface surveillance detection and tracking, extended radar detection ranges, high speed computer processing and an ability to process and display four times more information than current E-2C's. The production planes also have new, more powerful Allison engines.

Moreover, Grumman delivered two Omnibus Hawkeyes in 1988 and will deliver four this year. These are fleet Hawkeyes brought to Bethpage for electrical and electronic updates.

As of September, there were over 2,640 people working on Hawkeye and C-2A Greyhound programs.

In Washington, D.C., an E-2C multiyear buy for the Fiscal 1990 budget is being considered by Congress. The Navy could buy as many as 40 E-2C's over five years.

The production configuration must be stabilized before a multiyear production program can be started. However, the Group II configuration planned for the multiyear program must be approved by the Navy for sales to foreign military buyers. The Navy is working on that problem.

Grumman is now under a multiyear contract for 39 C-2A's. That program ends this year.

A-6

As 1988 drew to a close, the Defense Department made a decision: the A-6G program would not be in its budget. On December 16, Grumman Chairman John O'Brien announced that the 1989 operating plan required the company to reduce the work force by 3,100, several hundred directly attributable to the decision to stop the A-6G.

That same day, the Navy issued its stop-work order to halt the Digital Systems Development and Vehicle Improvement Programs — programs that would have produced the final A-6G configuration. The Navy had 30 days to change its mind, but that was considered unlikely.

"The A-6G was in and out of the budget almost on a weekly basis since Thanksgiving," said A-6 Program Vice President Dan Collins.

During the 1980s, Grumman had been developing a new, updated version of the Intruder called the A-6F. That program was cancelled at the beginning of 1988. Then, the less expensive version of this aircraft — the A-6G — had been proposed.

On June 30, 1988, the Navy signed a $185 million contract with Grumman to buy 10 new A-6E Intruders. That new contract extends the production line from December 1990 to September 1991.

Efforts are underway to make sure that the A-6 program survives in some form in Congress this year.

EA-6B

Grummanites are moving ahead on the Advanced Capability full scale development program for the EA-6B Prowler electronic warfare aircraft. The $255 million ADVCAP program opened a new lab in Melville in 1988. It contains a weapons systems lab and a software development station.

The company submitted proposals for major system improvements that will be part of the ADVCAP production aircraft. Among the avionic and structural improvements are an engine upgrade, more stores stations, improved radar systems, and the Global Positioning System, a satellite-based electronic navigation aide.

The 1,800 people on the EA-6B program will reach a milestone early this year when the ADVCAP prototype plane will be completed.

The program also finished its Engineering Development Facility in Calverton. The new building has laboratories, office accommodations, a computer complex and terminal room.

The first Block 86 production Increased Capability-2 (ICAP-2) was sold in 1988. Major development programs to enhance the current ICAP-2 configuration continued and, in September, Calverton got the 36th Prowler to enter the ICAP-1 to ICAP-2 modification program. The Navy has 12 squadrons and one training squadron operating Prowlers.

They Build The Stuffing. *Grummanites in Electronics Systems, such as Jim Giordano (above, L) and Kenny Wannen, build electrical and electronic components that go into aircraft like the E-2C and the A-6E TRAM (at R).*

Miles Of Wire, Tons Of Metal

Electronics Systems

At Great River, Electronics Systems builds many avionic systems, wiring harnesses, ground support and other equipment for Grumman's aircraft and other programs.

Under a Brookhaven National Lab contract, the division, with Space Systems Division's Energy Systems group, is making new technology workable for the semiconductor industry and its tester-on-a-board technology is being used in automotive electronic module testing.

Electronics Systems' Display/Trainer group won a contract to modify an electronic combat trainer at Whidbey Island NAS and another in September to modify F-14 trainers at Miramar and Oceana.

Last January, they started on the first phase of a contract to upgrade an Army helicopter flight simulator. Phase II was awarded in October. The upgrade of the Army's other 24 simulators could be downstream.

A recent survey shows that Electronics Systems' subsidiary Tachonics Corporation makes over 30 percent of the world's monolithic microwave integrated circuit switches and has over 60 MMIC products.

Early last year, Tachonics released the first digital standard cell library — a tool engineers can use to design and simulate gallium arsenide circuits. It's being used by the division's engineers on a Defense Advanced Research Projects Agency project to build a high speed, fiber optic data bus. They are also developing other products that will improve radar performance, target recognition and aircraft defense for other divisions' products.

On other contracts, Electronics Systems is working to give the smarts to "dumb" bombs. This is for a joint Air Force and Navy effort to get an inertial guidance system for Mk-80 series free-fall bombs.

1988 was a transition year for the Test Equipment Products group. The last of 124 RADCOM computerized testers was delivered in 1988. But its major new product, Intermediate Forward Test Equipment, should go into production soon. (See page 17.) And the CAT-IIID computerized automatic tester remains popular with the Navy, which bought another 30 in Fiscal Year 1988. The CAT-IIID should remain in service through the year 2000.

Aerostructures

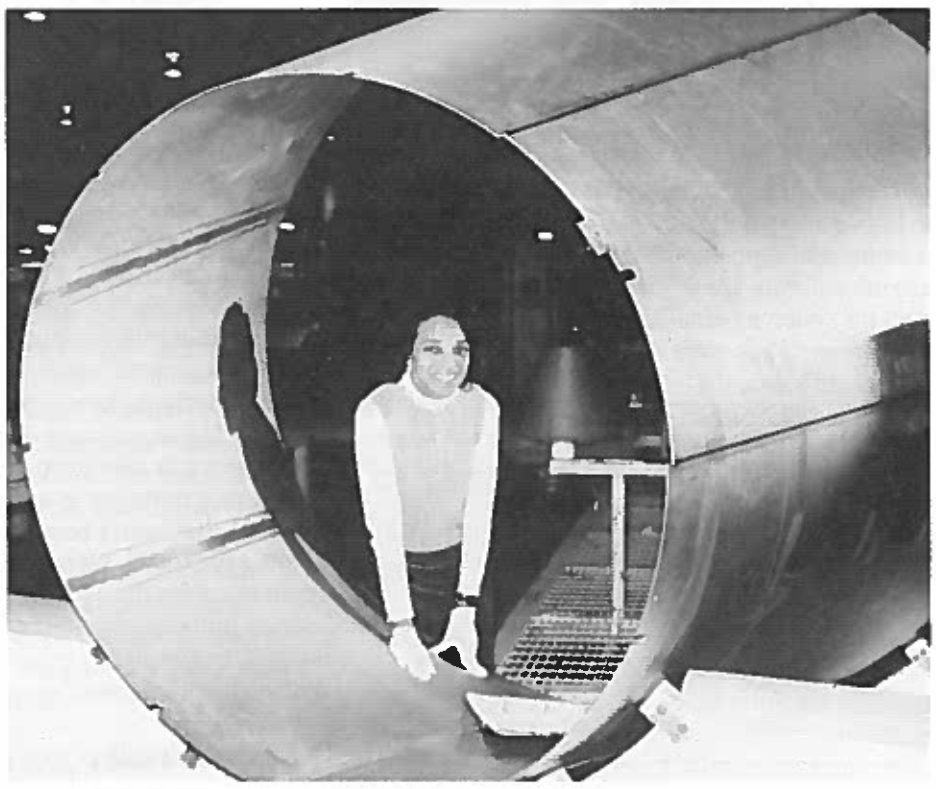
Grumman Aerostructures Division serves a world of customers in the subcontract market.

The division started delivering composite translating thrust reverser cowls for General Electric CF6-80C2 engines in 1988. Milledgeville makes the parts; Stuart assembles them.

The division wrapped up its major work in the V-22 Osprey full scale development program when it delivered the ninth empennage to Boeing Helicopter last year. Grummanites in Stuart assemble parts shipped from Milledgeville. In October, Aerostructures sent in the proposal for pilot production of the empennage. The award is expected early this year.

The division will see the first flight of the first updated S-2T Turbotracker early this year. It will provide kits for foreign sales to re-engine these planes and update their avionics and weapon systems. Grumman originally built the S-2 in the 1950s. Among the potential customers are Argentina, Brazil, Greece and Korea.

Full scale development work on the C-17 composite control surfaces program really took off last year. Engineering and tooling were finished in Bethpage and Milledgeville has begun to check out the tooling. The first test article will be delivered in June.



Satisfying Customers. *Pamela Graig (above) helps build MX missile shrouds in Bethpage. Brad Wilson (below, L) and York Halyard work on E-2C modifications in St. Augustine, Florida.*

In addition, a supply and services contract was signed with McDonnell Douglas, which expects to off-load C-17 tooling work. Production Operations is working on $2 million worth of C-17 tooling.

Stuart delivered the 100th shipset in the Gulfstream-IV/Fokker F-100 nacelle/thrust reverser program. This year the 1,500th shipset of nacelles and thrust reversers for the Garrett TFE731 engine will leave Stuart.

Last year, engineers designed a new-technology, graphite/thermo-plastic part. It's a weight-saving access panel for the V-22.

Working Now For The Future. *Vincent Baglio (L), a senior engineer in Aircraft Systems, is working on a new computer system that will help aircraft safely fly at low altitudes. An X-29 aircraft model is being used for simulation development of the system. Dr. John Litke (below), a systems scientist for Data Systems Advanced Development in Woodbury, is helping to develop software that will diagnose and fix itself should a failure occur.*

Future Attractions In Grumman High Tech

Cockpit Of The Future

Three dimensional sound, helmet mounted displays, new escape systems and repositioned flight and engine controls are some of the new cockpit systems being explored by Grumman. They were discussed at Grumman's recent University Technology Forum in a presentation by Dr. Dan Tufano, manager of Grumman's Advanced Crew Station Technology Thrust project.

"When a missile is fired at a plane, the pilot cannot hear what direction it is coming from," says Tufano. "A three dimensional audio system in the pilot's headset would simulate the missile sound the way it would be heard coming from the direction it was fired."

The visor on the pilot's helmet might become a projection surface for information such as weapon sights, altitude, airspeed and other flight control information.

Aircraft in the future may fly much faster than those we have today. "Ejection at these high speeds may be impossible," says Tufano. "A pilot could eject in a capsule or section of the aircraft, which would eventually slow down and permit safe escape."

Grumman has already received a patent on a new design for the positioning of the flight and thrust control sticks in the future cockpit. "The pilot may have to lay flat to cope with high G forces," says Tufano. "Flight control sticks, for example, could be positioned on the arm rests of his seat rather than on the floor between his knees."

Systems That Forgive

"In a fault tolerant system, certain components can fail and the system as a whole keeps operating," says Dr. John Litke, a systems scientist for Data Systems Advanced Development in Woodbury.

Fault tolerance is now being engineered into computers, cars and aircraft. But Litke's team is looking at a newer application: software, the code that tells electronic devices what to do.

"The goal is for a software program to diagnose itself, to discern if its own basic structure is faulty," says Litke. One solution is distributed programming: developing control software in segments, each with parts of the underlying language and machine code. If one segment goes awry, the others can take over.

"Distributed programming is a powerful technique that hasn't been explored much," says Litke. "It has long-term application for the Strategic Defense Initiative programs, the Space Station, and future battlefield management systems."

Flying At Low Altitude

Grumman is working on a simulation system that will help future aircraft fly in and out of mountainous terrain at very low altitudes.

Using a Terrain Following Terrain Avoidance System, aircraft would be less vulnerable to detection because of having to fly too high above mountainous regions and using emittable radar to plot their paths.

"If a pilot plans a mission in Libya, for example, he could take aboard a computer disk or tape containing a digital terrain map of the area," explains Vincent Baglio, a senior engineer working on the system.

"That information would be combined with a map navigation system, identifying the aircraft's location on the map," says Baglio. "The entire process could be automatic — no pilot input would be needed."

A trajectory generator uses the map data to plot a safe flight path. A plane's flight control system follows this path. Grumman engineers are using an X-29 model for system simulations, because that aircraft's fly-by-wire flight control system allows it to automatically follow this path.

Travel The World Without Jet Lag

In the dome of the Simulation Systems Development Lab in Building 14, Bethpage, battle managers, engineers, and technicians can measure now how future weapons will perform.

The lab can simulate airborne, ground, at-sea and space-based platforms. A full-length screen and three video projection units display to the crew a panoramic view of any part of the world. Radar and infrared presentations are also provided. The lab is slated to open in February.

From Trucks To Testers, Customers Get Excellence

By Land And Air. *Above, driver Mike Macrides checks a list of parcels with supervisor Carlos Krind at the United Parcel Service's Farmingdale, Long Island Center. At R, General Mohammed Hammouda of the Egyptian Air Force has been liaison officer on the E-2C program since 1987. Grumman has sold five E-2C's and a tactics trainer to Egypt — and Gen. Hammouda calls it 'one of the best planes made.'*

Miles To Travel

"In the holiday season, we handle over 100,000 pickups and deliveries each day," says Jim Feeney of the United Parcel Service sort facility in Farmingdale, Long Island.

To get all those packages out on time, the center has 238 package cars — among them, Grumman Olsons. UPS is this Grumman unit's biggest customer. Grumman Olson has built about 5,000 of the dark brown UPS trucks in the past two years.

There are 1,100 UPS centers nationwide. The Farmingdale sort facility owes much of its volume to Long Island's density of shopping centers, businesses, and population in general. In addition, retailers make many special orders during gift-giving season.

"Besides stores, there are many catalog firms locally. We even handle packages ordered through cable television," says Feeney.

Co-Worker As Customer

"Even before the Grumman Quality program was launched," says Mark DiFilippo, "the people in Data Systems were very conscious of relations with customers inside Grumman." DiFilippo is systems manager for the Product Operations department of the Aircraft Systems Division. Product Ops uses a lot of computer equipment and services — about $35 million worth last year. Data Systems is a major supplier.

The department relies on about 130 personal computers for information on budgets, expenditures, and other business needs. It is expanding a local area network in Building 3, enabling PCs to communicate with each other in addition to other computers.

It also plans to install minicomputers, to which the PCs will have access, for distributed processing: most software is written by people who work on the machines, not programmers.

New ATE Joins The Ranks

"When someone asked me what an Army division was, I thought we were in trouble," jokes Colonel Don Bullock, the U.S. Army's Intermediate Forward Test Equipment (IFTE) program manager. "Today, Grumman people at all levels have learned to speak 'Army' pretty well."

Grumman Electronics Systems' IFTE is a computerized tester that will be used by the Army to troubleshoot weapons at the front lines and also in the rear depots.

It is the first Grumman test equipment produced for the Army; Grumman is a long-time supplier of Navy test equipment. Bullock says that the Army has never bought such a broad-ranged test system before.

"We've given IFTE an exhaustive testing," Bullock says. February is the target date for the production decision; Grumman could start producing IFTE base shop test stations and contact test sets in March.

Foreign Relations

When Rania, 16, and Khaled, 14, first attended school in the United States, the other kids in their class were anxious to know two things: What do the pyramids really look like and do you have a camel?

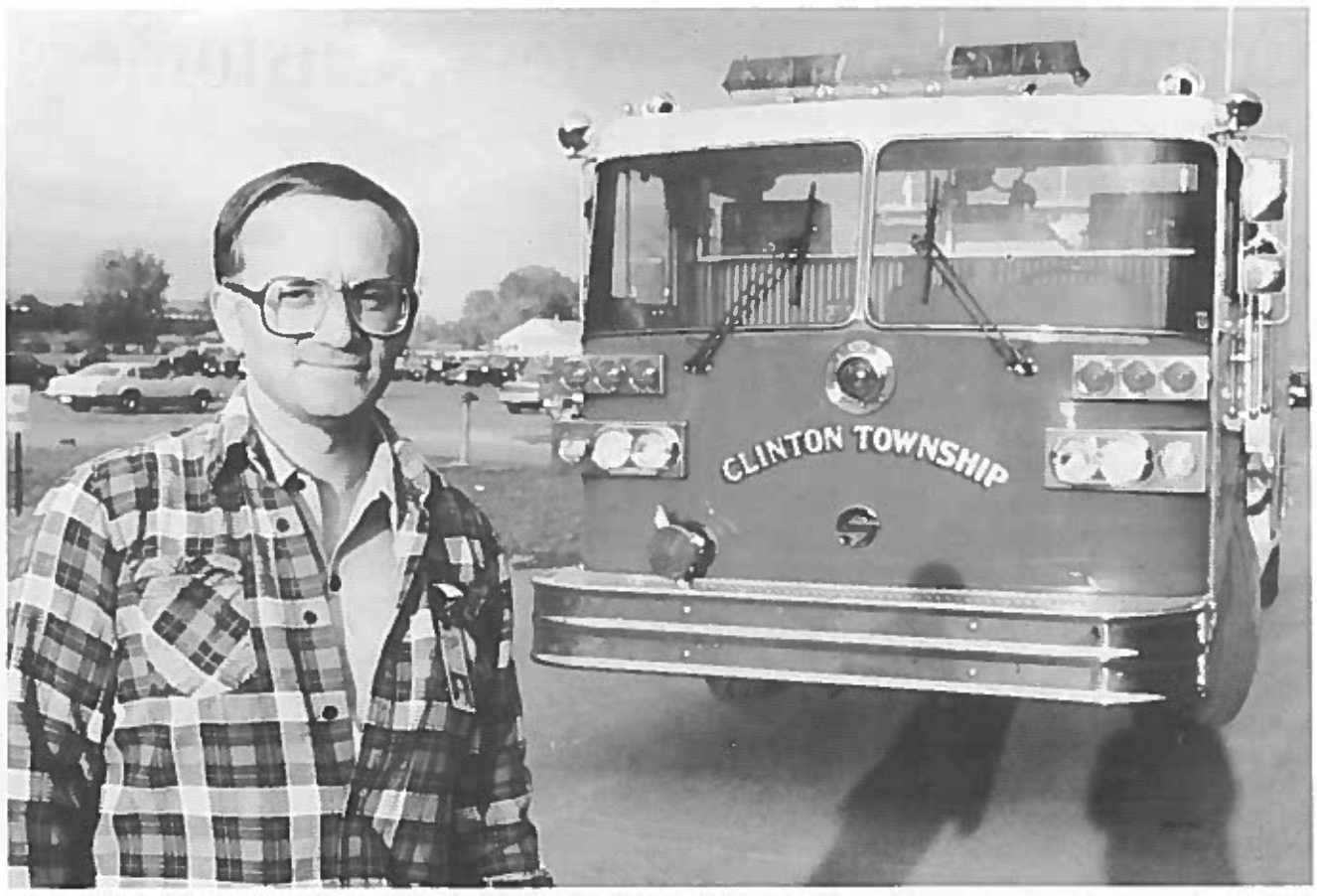
Rania and Khaled are the children of General Mohammed Hammouda, an Egyptian Air Force officer working as a liaison at Grumman on the E-2C program since 1987. "We'll have a tough time when we leave," says Hammouda. "We've made a lot of friends."

Grumman has sold five E-2C's and a tactics trainer to Egypt. Hammouda says he and his country are very happy with the aircraft and the way Grumman has helped to make it a successful program.

"We're very proud to have one of the best planes made in our Air Force," says Hammouda. "They are always ready to fly at a moment's notice." Hammouda attributes the aircraft readiness to the 116 Grumman people in Egypt, who help to make the program run smoothly.

User Group. *This group in Aircraft Systems is a satisfied customer of Grumman Data Systems. Shown are (seated, from L) Danielle Anderson, Elaine Weaver, (standing) Leni Kaufman, Mark DiFilippo, Judy Tripp, Fred Yager, Pete D'Andrea, Philip Bevelacqua, and Victor Mazza.*

Troubleshooter. *'It's reassuring to see the level of dedication Grumman people put into this program,' says Army Colonel Don Bullock.*



Lifesavers. *Above, Harold Jordan once walked 12 miles to give blood and is now almost at the 10-gallon mark. At R, Dale Shaffer is one of 14 firefighters at Grumman's Montgomery, Pennsylvania, facility. Despite the fast pace of the LLV line, Grumman never stands in the way of their duty.*

Four Faces Of Community Pride At Grumman

Relief Crew

Not many people would jump at the chance to spend Christmas holidays on a Navy ship off the coast of war-torn Lebanon. In 1985, Grummanite Fred Luhrs did. Luhrs, a machinist on the night shift in Building 3, is a radar operations specialist in the Navy Reserve.

"Two hundred reservists were needed to relieve the crew of the U.S.S. New Jersey," says Luhrs. "These guys had been over there for 90 days without a break. So I volunteered."

Luhrs serves one weekend a month and a two-week stint each year. He had three years' active duty and has been a reservist for 17 years.

Shaping Up City Hall

"I want to make my town a great place to live," says Dan Lashley, a master jig assembler at Grumman Olson in Sherman, Texas. He also just finished his first year as a member of the Colbert, Oklahoma, town council.

Colbert is a town of 1,500 just north of the Texas border. The council has made some significant accomplishments during Lashley's tenure. It expanded its police department, now offering citizens around-the-clock protection. The council also cleaned up its ambulance service, which had been mismanaged by a former city employee.

Lashley was appointed to the council after a member resigned. "I had to think hard about it," he says. "You take a lot of heat in this job."

But Lashley, who is also a volunteer firefighter and emergency medical technician, will be running for election in April.

Gift Of A Lifetime

When the movie ended, 17-year-old Harold Jordan stretched his legs and crumpled his popcorn box. On his way to the exit, the idea that he was about to save someone's life was the furthest thing from his mind.

But that's exactly what happened. Jordan, now 58, works in Bethpage's Building 12 for Corporate Services. He recalls that day when he donated his first pint of blood to an accident victim.

"I guess the noise of the film muffled the sound," says Jordan. "A train had derailed onto the street in front of the theater. When I got outside, I could see there were several people hurt. Fortunately, I had found out the day before that I had type A blood. So, when a medical person yelled out, asking if anyone had that type blood, I put my hand up and screamed back, 'I do.'

"They put me right next to a woman in the street who was badly hurt so they could give her an immediate transfusion," he says. "I'll never forget how it felt knowing I may be the reason this woman lives."

Working at Grumman for 22 years, he is three pints short of the 10-gallon mark. "That doesn't count all the years I donated before I came to Grumman," says Jordan.

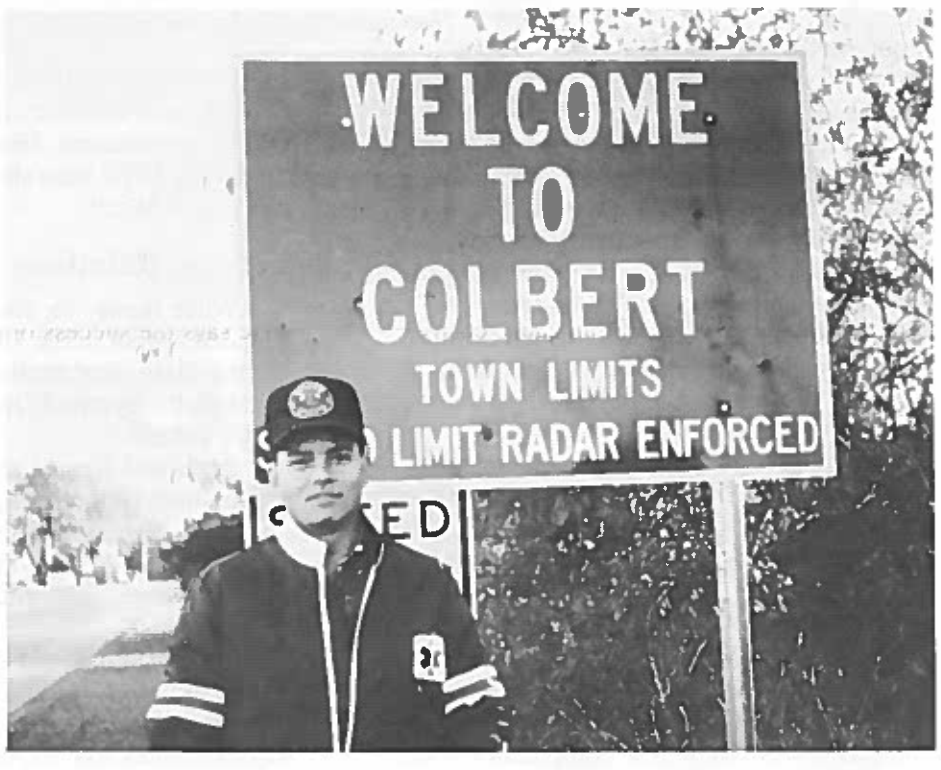
Lifesaving Duty

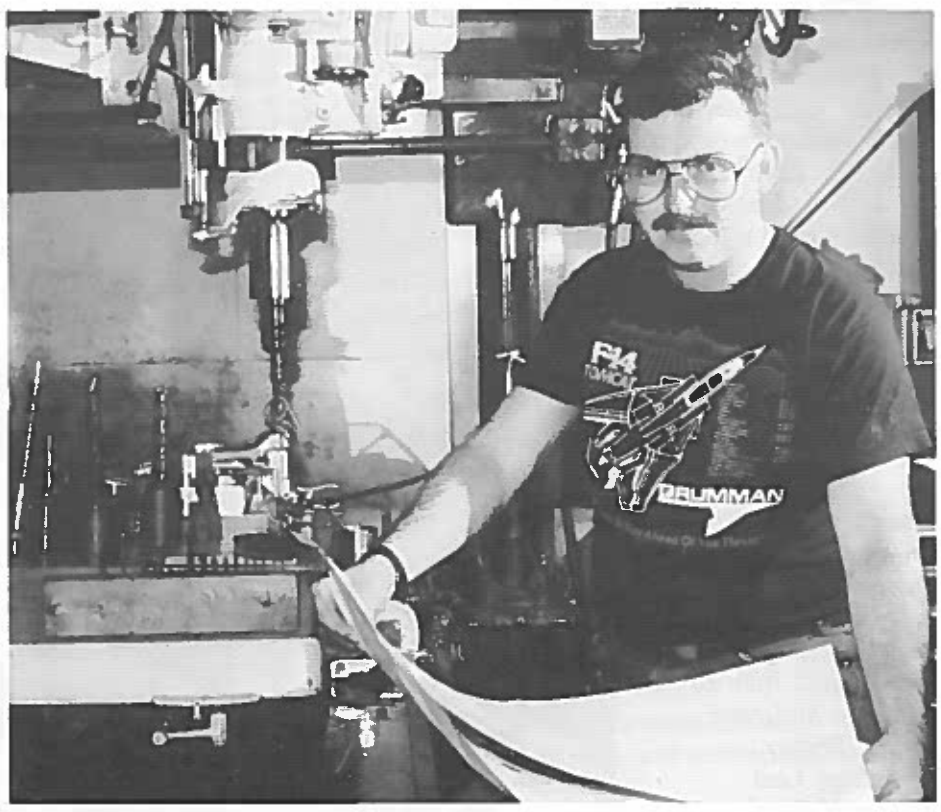
"What if your house was burning down and no one came to help put the fire out?" says Dale Shaffer, a warehouse supervisor at Grumman's Long Life Vehicle facility in Montgomery, Pennsylvania. "That's why I volunteer."

Shaffer has been a firefighter since 1969. A fire that year changed his life.

"I was home from work 10 minutes when I heard the sirens blow," he says. "The house down the block was burning. I had just passed it and didn't see any smoke. A five-year-old girl was killed. I kept thinking, I would have gotten a call if I had been a fireman then. I might have been there in time to save her."

Shaffer had been a firefighter in the Navy. Although he gave it up because of the danger, he now says his fear of not being there to help save someone's life is worse than his fear of getting hurt.





Civic Pride And Patriotism. *At top, Dan Lashley has lived in Colbert, Oklahoma, for five years and has been a town councilman for one. 'The knowledge I've gained since last October has been invaluable,' he says. Above, the Navy depends on reservists like Fred Luhrs. Besides the sea-going duty, Luhrs enjoys using the trade he learned in the Navy: radar operations.*

Grummanites Always Striving To Be The Best

Not A Trace. *Michael Kripaitis, an environment control systems technician, uses a vacuum to eliminate any traces of FOD aboard this F-14.*

Fighting FOD

Foreign Object Damage (FOD) reports during 1988 continued to highlight the need to watch for foreign material in Grumman aircraft or on the ground around them.

"Foreign objects don't belong near our aircraft," says Norm Reinertsen, vice president, Quality Operations. "They can cause costly damage to the aircraft or the engines and perhaps even the loss of someone's life."

Reinertsen says that FOD prevention is everyone's responsibility and Grummanites can't relax their efforts to prevent FOD. Debris can find its way into the aircraft and possibly go undetected until it migrates and causes damage.

In 1989, Grumman's FOD prevention activities must show improvement in reduced instances of damage or debris. "Otherwise, our efforts are wasted and our reputation severely damaged," says Reinertsen.

He says the success of the FOD program depends on every Grummanite. "We all must work to stamp out FOD by doing a better job of eliminating debris in and near our aircraft."

Project Sterling

As of September 1988, 1,628 Grummanites submitted 2,196 suggestions to Grumman's Project Sterling program.

Of those suggestions, 785 were implemented. These suggestions saved the company $7,801,695.

The winners shared 491 cash awards. These awards were valued at $46,160. There were 94 stock awards, totalling 4,214 shares and valued at $91,365.

Quality Circles

As of December 1988, there were 39 Quality Circle groups operating at Grumman. These groups consist of nine coordinators, 18 facilitators, and 302 leaders and members.

The groups have had 17 of their suggested projects implemented. Only one suggestion was rejected and there are 13 awaiting approval.

The suggestions have saved the company over $1,112,000.

The More We Learn, The Better We Build

A Total Look. *Daniel Brady, an engineer in Aircraft Systems, graduated last year with a master of science degree in mechanical engineering. He attended school as part of Grumman's Master Fellowship program. He also spent the past two years working in various departments at Grumman. 'I've seen the entire process now,' says Brady. 'I realize the importance of a good design and what it actually takes to get that part into the aircraft.'*

Grummanites are always looking for ways of doing things better. Often this means furthering their training and education. Last year, many Grummanites did just that.

There were 221 classes offered in Skills Training in various manufacturing techniques; 1,683 Grummanites attended these classes for a total of 13,932 hours.

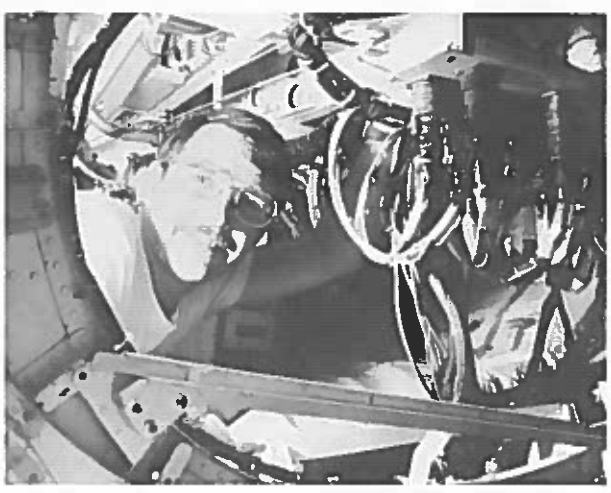
About 1,300 students spent approximately 18,800 hours attending 147 Systems Training classes such as GE engine operation training for the F-14A(PLUS) aircraft and the cockpit and ground safety courses for the Joint STARS program in Melbourne, Florida.

Corporate Training, which includes Management Development, Office Automation, Voluntary Education, Grumman Engineering Manufacturing Systems training, and Ethics Training, enlightened 5,691 Grummanites in 1988.

The company spent about $2,173,300 on tuition reimbursement for those Grummanites who sought training outside Grumman.

In addition, 18 Master Fellow Grummanites graduated last year, while another nine students began the two-year program.

She Teaches What She Learns. *Elaine Weglarz teaches Office Automation in Grumman's Corporate Training department. With the help of tuition reimbursement, Weglarz will graduate from college this May with a bachelor's degree. She specialized in business computer information systems.*



Perfect Fit. *As a hydraulic technician at Grumman's Stuart Operations, Jules Grosjean took a skills training course in tightening tube connections. 'Tightening a nut onto a flex hose seems easy, but there are specs that dictate how tight they should be. That's important,' he says.*

GrummanWorld
Grumman Corporation
A22-GHQ
Bethpage, N.Y. 11714

Bulk Rate
U.S. Postage
Paid
Hicksville, NY
Permit No. 1110

GrummanWorld

January 13, 1989

1988 Annual Report For Grumman People